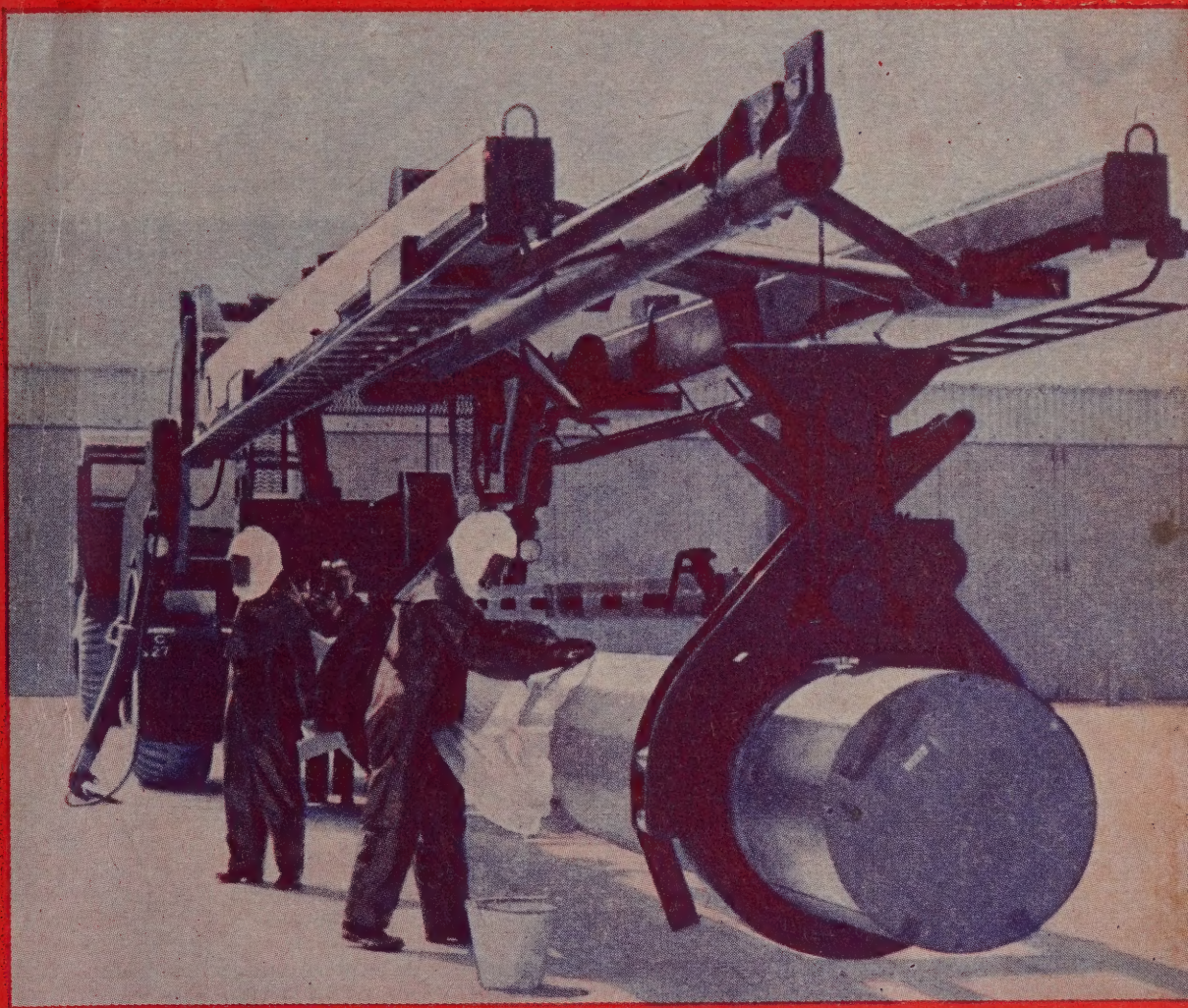
RADIO TELEVISION AND HOBBIES

2/-

Vol. 19 No. 5
AUGUST, 1957

Registered in Australia for transmission by post as a periodical.



AWV RADIOTRON
The World's Finest Radio Valves

NOW! Correspondence TV for the Countryman!

When television is established, opportunities will occur in country centres for trained technicians. Anticipating this, the Marconi School of Wireless has completed a thorough correspondence course covering every phase of television, and including three weeks intensive practical training on TV equipment at Sydney or Melbourne. You can start your training *now* by merely asking for a special booklet giving complete details.

MSI-57

COMMERCIAL OPERATOR'S COURSE

Since 1913, the Marconi School of Wireless has trained hundreds of young men who have secured Certificates of Proficiency to fulfil positions as radio operators at sea, on land and in the air.

You may take advantage of this Commercial Operator's Course also by correspondence. Ask for details.

OTHER COURSES AVAILABLE

- SERVICE MECHANICS
- AMATEUR RADIO

FILL IN AND POST COUPON TODAY TO..

MARCONI SCHOOL OF WIRELESS

G.P.O. BOX 2516, SYDNEY.
G.P.O. BOX 1674N, MELBOURNE.

Please send me your FREE Booklet

NAME.....
(BLOCK LETTERS)

ADDRESS .....

.....

MARCONI SCHOOL OF WIRELESS
conducted by
AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED

Distributed in NSW by Sungravure Ltd., 21-29 Morley Avenue, Rosebery, NSW; in Victoria by Associated Newspapers Ltd., 247 Collins Street, Melbourne; in South Australia, Western Australia and Queensland by Gordon & Gotch (A/sia) Ltd.; in New Zealand by "Truth" (NZ) Ltd.; in Tasmania by Davies Bros. Pty. Ltd. ("The Mercury", Hobart).

EDITORIAL

THERE has been little change in the general TV position during the past few months. Stations are settling to a steady routine, featured shows have filtered down to their set positions, and in this connection we see a marked similarity to the program building technique already familiar in broadcasting.

Set sales continue to be steady. Recovery from the slump earlier in the year has been maintained, but there are no signs of either a sudden boom in licences or a noticeable lapse.

Business has been better than some people expected but not as good as the most optimistic estimates which were given by others. I cannot see how this position is likely to alter for some time, unless a co-ordinated move is made, particularly on the program side, to encourage a boom.

And this might be a very good thing to get under way later in the year. A six weeks' intensive effort by the entire industry might produce extremely valuable results. It is dangerous to stand still too long in the TV world. Old faces and long repeated sessions can become intolerably boring almost overnight, and already there are many people ready to spread the gospel that the TV programs are not worth the price of a set.

Radio set manufacturers can, I think, expect little immediate impact on their receiver sales, but it would be foolish not to realise that, when enough TV sets are in operation, few people will forsake the screen for the loudspeaker.

Fortunately, the radiogram and record world are proceeding from strength to strength.

Australia has proved an immense field for gramophone records, and overseas people just can't understand how we absorb them all.

For instance, recent estimates show that, whereas America consumes something like 130 million discs per year for nearly 200 million population, Australia is expected to get through 10 million records in the next 12 months with a population not exceeding 10-million.

And there doesn't seem to be an end in sight. From our point of view, more and more home constructors are making up hi-fi amplifiers, or buying them, and every new owner spreads the gospel of sound.

Not only in numbers are we fortunate, but also in quality and quantity. There is nothing wrong with the standard of pressings which come to me every week, and practically every worthwhile disc released in the world finds its way into catalogues.

There may be a very gratifying moral in all this. I'll leave it to you to work it out for yourself.

John Moyle

INDEX

	Page		Page
Surgeons Teach With Colour TV ..	3	Here's Your Answer Tom!	57
Miniature Parts Made Bizmac ..	4	Our 17-inch Television Set	62
Recorder Weighs Under 2lb	9	Simple Course in Radio—8	73
Bouy Telemeters Ocean Data	11	Let's Buy an Argument	80
Dentist's Closed-Circuit TV	13	Testing with Square Waves	85
Air Pressure and the Weather ..	16	A Reader Built It!	91
Technical Review	21	Trade Reviews and Releases	93
News and Views of the Month ..	29	A Course in Television—Part 23 ..	96
The 1957 3-Band Three	32	Off the Record	102
From the Serviceman Who Tells ..	41	Short-Wave Notes	112
How to Build Your IF Strip for TV	48	The Ham Bands	113
		Answers to Correspondents	125

RADIO ★★ TELEVISION AND HOBBIES

A NATIONAL MAGAZINE OF RADIO, TELEVISION HOBBIES AND POPULAR SCIENCE

EDITOR

JOHN MOYLE
S.M.I.R.E. (Aust.)

TECHNICAL EDITOR

NEVILLE WILLIAMS
M.I.R.E. (Aust.)

MAURICE FINDLAY
A.S.T.C.

PHILIP WATSON
M.I.R.E. (Aust.)

W. YASHIN

MERVYN HUDDLESTON

Vol. 19 No. 5

SUBSCRIPTION RATES

C'wealth, NZ, N. Guinea, Fiji—£1/4/- pa.
United Kingdom—£1/7/- pa.
B. Empire—£1/9/- pa.
Foreign—£1/11/- pa.

Phone -- -- -- -- B0944

OUR COVER PICTURE

Special protective clothing is worn by men fuelling the rockets used at the Guided Weapons Wing of the British Army Artillery School. The weapon is a 45ft Corporal, of 5 tons and 50 miles range.

Palec

Range of TV and RADIO INSTRUMENTS

MODEL ET4A TUBE TESTER.
Embodying a Self Cleaning, Flexible, Lever Action Element Switch in accordance with R.M.A. code which will completely cope with past, present and future RADIO AND TELEVISION TUBES including PICTURE TUBES, tubes with tapped filaments or double supported elements, etc. Picture tube extension lead extra.

MODEL MX32. Thirty-two range.
Television Multimeter:—20,000 O.P.V.
Current: DC to 10 Amp
Current: AC 0-1 mA (for use with ext. C.T.).
Voltage: AC and DC to 1000 Volts.
Resistance: 0-10 Megohm (Int Battery)
Decibels, etc.

MODEL M32. Thirty-two range.
Radio and Electrical Multimeter:—1000 O P V Ranges as MX32

MODEL MX47

Forty Seven Range Television Multimeter. 20,000 ohms per volt.

Current: AC and DC to 10 Amps.
Voltage: AC and DC to 3000 Volts.
Resistance to 50 Megohms (Int. Batteries) to 500 Megohms (ext DC Supply)
Decibels. Output, etc

METER PROTECTION
High voltage DC Probe to extend range to 30,000 volts available

MODEL M52. Fifty-two range Laboratory Multimeter:—1,000 O.P.V.
Current: AC and DC to 30 Amps.
Voltage: AC and DC to 1000 Volts.
Resistance: 0-5 Megohms (Int Batteries), Decibels Output etc.

MODEL M42. Forty-two range. General Purpose Multimeter:—1,000 O.P.V.
Current: AC and DC to 10 Amps.
Voltage: AC and DC to 1000 Volts.
Resistance: 0-5 Megohms (Int Batteries). Decibels, Capacity, etc.

Common Features of Multimeter Models 47, 52, and 42.
Semi-hard rubber housing; Spring loaded jewel bearing meter movement to minimise effects of shock; Range steps 1, 3, 10, 30, etc.
Send for descriptive literature.
Terms Available

Model TV-M Vacuum Tube Volt-Ohm-meter.
This instrument is a basic necessity for Television Service.
Features: DC Volts; AC Volts RMS; AC Volts Peak to Peak; Resistance to 1000 Megohms and Decibels. 42 ranges in all.
Extras.—Crystal Diode Probe (TVHF) extends HF measurements to 400 megacycles.
High Voltage Probe (TVP) to extend DCV range to 30,000 Volts.

TRADE PRICE LIST

(Subject to Alteration without notice.)

MODEL	Description	Trade Price
ET4a	Tube Checker	£37 15 0
PTL	Picture Tube Extension Lead	£1 7 6
TVM	Vacuum Tube Volt-Ohm-meter	£49 17 6
TVP	High Voltage DC Probe to extend range of TVM to 30,000 Volts	£9 10 0
TVHF	H.F. Crystal Diode Probe to extend TVM to 400 megacycles	£4 17 6
MX32	Multimeter (20,000 Ohms/Volt)	£23 17 6
MX47	Multimeter (20,000 Ohms/Volt)	£39 15 0
MXP	High Voltage DC Probe to extend range of MX47 and MX32 to 30,000 Volts	£9 10 0
M32	Multimeter	£17 18 6
M42	Multimeter	£32 12 6
M52	Multimeter	£43 15 0

All Prices subject to 12½ pc Sales Tax.

SERVICE

Our Australian-built products have the advantage of being backed by local factory services.

TECHNICAL PROBLEMS

Our Technical facilities are at your disposal.

Australian Agents for
MEGATRON PHOTO-ELECTRIC CELLS

WRITE FOR CATALOGUE TO:—

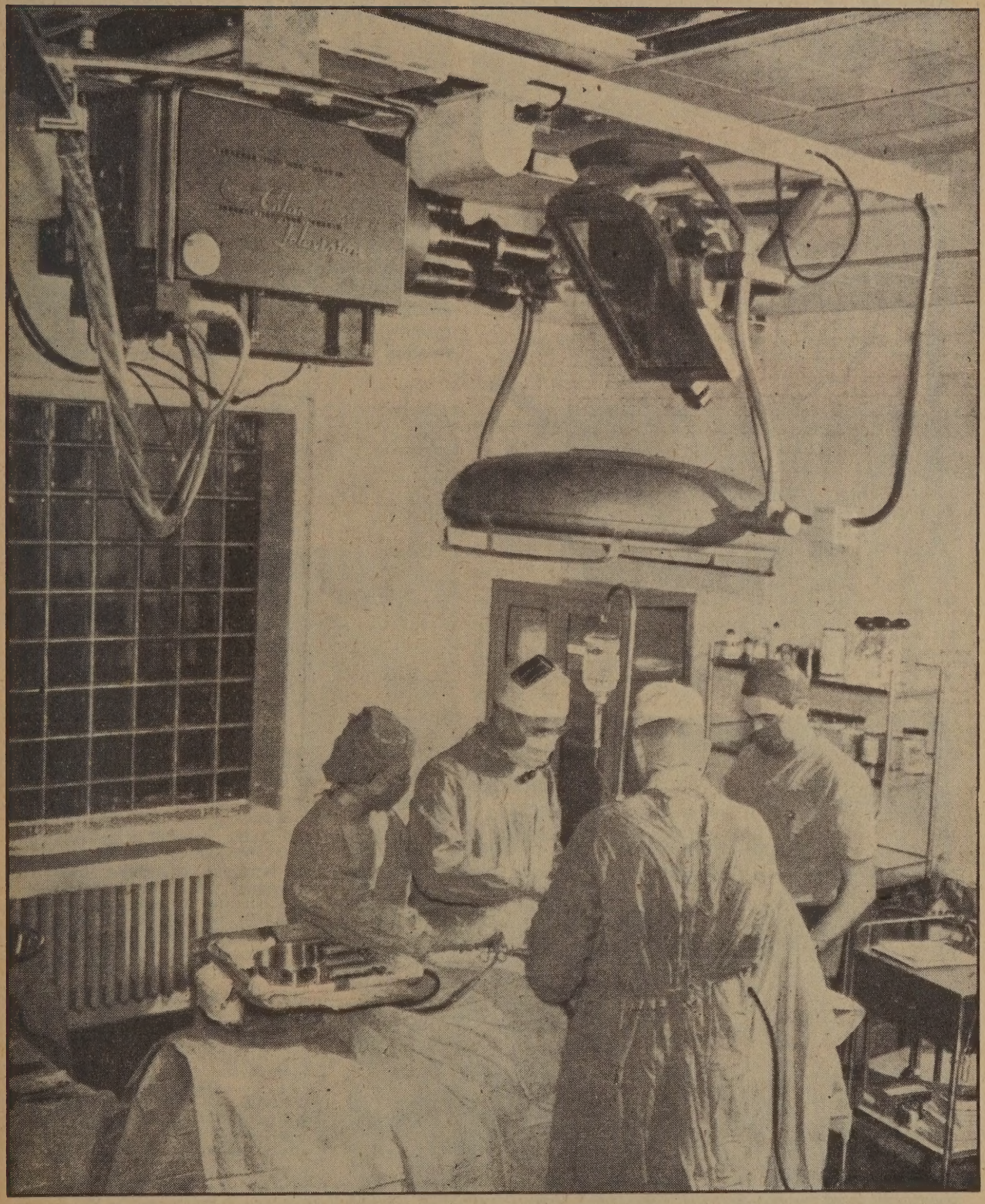
Paton Electrical Pty. Ltd.

ASHFIELD, SYDNEY • UA 5266 (5 lines)

REPRESENTATIVES:

MELBOURNE: R. G. Holloway, 299 Little Lonsdale St. **BRISBANE:** K. H. Dore & Sons, Elizabeth & Albert Sts. **ADELAIDE:** Newton McLaren Ltd., 17-23 Leigh St. **PERTH:** Carlyle & Co. Ltd., 915-917 Hay St. **TASMANIA:** Gebbie Harvey Pty. Ltd., 76 Wellington St., Launceston. **NEW ZEALAND:** Carrel & Carrel Ltd., 41 Shortland St., Auckland.

SURGEONS TEACH WITH COLOUR TV



Television continues to make rapid strides in the industrial and medical field. The development of color TV has enormously increased the potential information which such systems can provide. The Walter Reed Army Hospital in Washington DC has installed this equipment so that surgical work can be relayed to students and observers. For story on dental TV turn to page 13.

MINIATURE PARTS MADE BIZMAC

The World's Largest Electronic Brain

1. Information on more than 170,000 separate tank and automotive spare parts is fed into the Bizmac system daily from depots shown on the map.

2. The information comes in on punched cards and is transferred to magnetic tape. Each reel, above, holds as much information as ten file shelves.

The march of electronics, varied in its many phases, nevertheless is a tightly co-ordinated movement. Paradoxically enough, the development of smaller components has allowed the design and construction of mammoth devices which would have been almost unworkable without the compactness of miniaturisation and the introduction of simpler ways of doing things. Thus this huge electronic "brain," recently demonstrated by R.C.A. of America, owes much of its success to the ingenious use of little things.

KNOWN as Bizmac, and claimed to be the largest calculator of its type in the world, it was recently demonstrated in public for the first time, when the U.S. Army Ordnance Corps looked it over.

This Corps is one of the largest handlers of materials in existence, and the paper work necessary to keep tag of its great stores is an enormous item in administration and man power.

Not only is accuracy and capacity required, but speed in extracting information is vital in an organisation dealing with defence. Time is often the controlling factor in determining the practicability and planning of operations.

Bizmac, which cost more than 4m dollars, is installed at the Army Ordnance Tank-Automotive Command headquarters in Detroit, where it has reduced months of paper work to minutes of push-button operation. Incidentally it is expected to save the Army many times its cost apart from its other advantages.

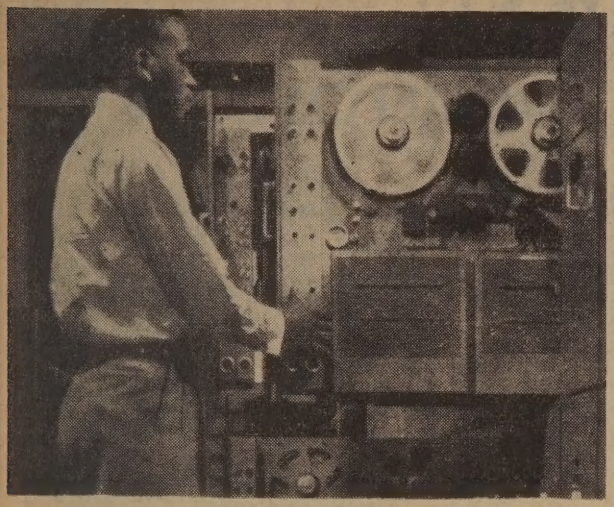
It keeps track of more than 100m facts about the Army's vast inventory of tank and automotive spare parts throughout the world—everything from nuts and bolts to entire engines. Bizmac maintains up-to-the-minute information about what supplies are on hand, how fast they are being used, what has to be ordered and in what quantity.

LIGHTNING SPEED

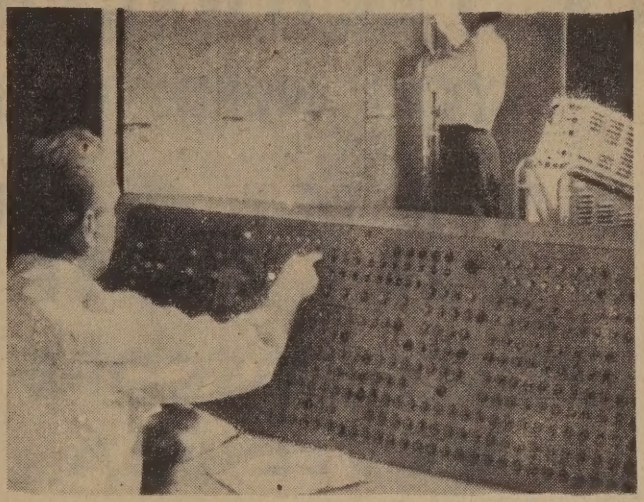
The Bizmac installation in Detroit includes some 220 units of 19 different but fully integrated types of equipment. It can handle more work than any other data processing system because of its ability to do a number of operations simultaneously and to control and co-ordinate them from a central point. The system can complete in 48 hours an inventory procedure that once took up to three months; process by computer in one hour as much work as 400 girls with hand-calculating machines could turn out in the same time; read from magnetic tape at 1,700 words per second—a rate at which it could finish Tolstoy's "War and Peace" in about five minutes.

The pictures shown here give some

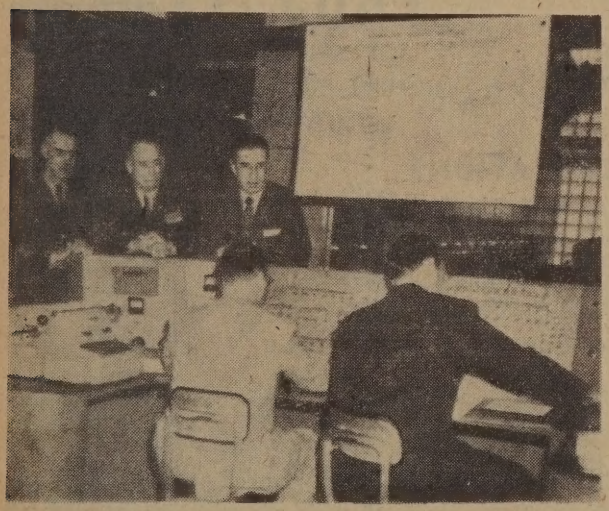
STEPS IN THE OPERATION OF GIANT CALCULATOR



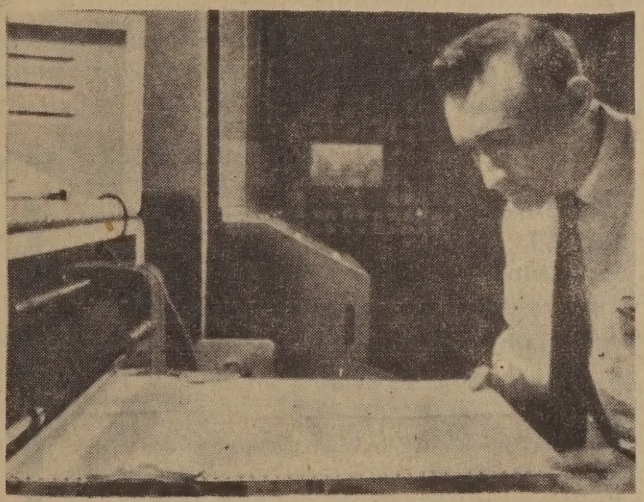
3. Some 182 Tape Stations, like the one above serve as basic storage medium. Each station can be connected to other units at the push of a button.



4. The magnetic tape is run through a Sorter, above, which does the electronic equivalent of "paper shuffling"—putting data in the proper sequence.



5. Tape is then processed through the Computer, which automatically updates the files and singles out items for the attention of the supply manager



6. When Computer finds a depot short of an item, it passes information on to Electro-Mechanical Printer which prints reorder form at 600 lines a minute.

7. If one particular fact is needed quickly, this Interrogation Unit can search system's entire 100 million facts and find the answer within three minutes.

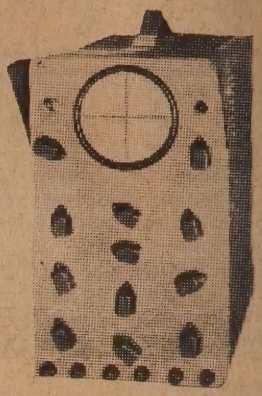
8. All of Bizmac's 220 units can be operated by remote control from this room, known as System Central, which is similar to a telephone exchange.

TV TECHNICIANS!!

YOU NEED THIS OSCILLOSCOPE—

"TAYLOR"

OSCILLOSCOPE MODEL 32A



AS USED AND ENDORSED BY THE MAJORITY OF SERVICE ORGANISATIONS

A robust, portable wide-band instrument designed to meet the requirements of television, industrial and radio service work.

PRICE £130
(PLUS TAX)
HIRE PURCHASE TERMS AVAILABLE

TECHNICAL SPECIFICATIONS

VERTICAL DEFLECTION
DIRECT INPUT
Sensitivity—12.5 R.M.S. per inch
Input resistance approximately 5 megohms

'Y' AMPLIFIER
4 valves, cathode follower input
Push-pull output
Sensitivity—80mV R.M.S. per inch of symmetrical deflection
Frequency response, 10 c/s to over 6Mc/s within plus ½ minus 3 db.

TIME BASE
FREQUENCY
Continuously variable sweep from 2c/s to 100Kc/s in 5 overlapping ranges
repetitive or triggered
Flyback suppression

DIMENSIONS
Height—Overall 13" width 7½"
Length—Overall 19"
weight—32lbs

TUBE
EMITRON 88D (GREEN) 4" DIAMETER FLAT FACE
AVAILABLE SCREEN DIAMETER—3½"

Obtainable from the sole Australian Agents

JACOBY MITCHELL & CO. PTY. LTD.

477-481 KENT STREET
SYDNEY
PHONE: MA8411

DISTRIBUTORS IN ALL STATES

JACOBY MITCHELL
EQUIPMENT FOR INDUSTRY AND RESEARCH

idea of the steps required in operating the huge equipment and the comparatively few operators needed to handle such a large amount of information.

The trend toward miniaturisation has gone a lot further than the average consumer would imagine on the basis of the small radios and smaller hearing aids which he sees.

It is safe to say that much of the special electronic equipment, other than Bizmac, and including military weapons would be impossible without it. One cannot envisage such equipment performing sophisticated functions, at the same time being small enough to be toted around in the nose of a rocket, without extreme economy in space.

Here are some of the important R.C.A. developments in various fields made possible by the use of miniature components.

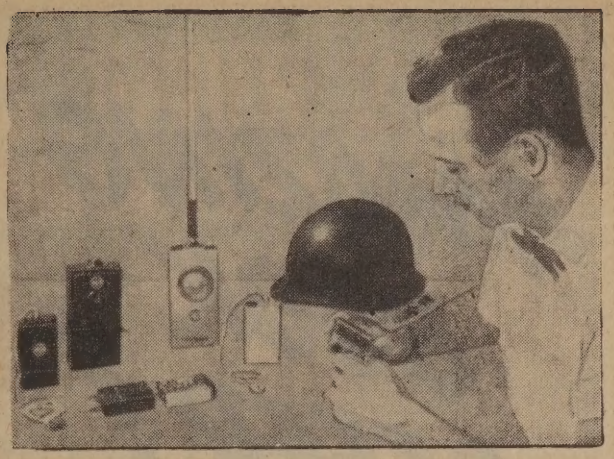
- An all-transistor voice-multiplexing system for military micro-wave radio communications that will be 90 per cent smaller and lighter than comparable conventional equipment and will consume 95 per cent less power. Scarcely larger than a 14in portable television receiver, it will weigh only about 85lb compared with 1100lb for conventional multiplexing systems
- An ultra-miniature FM radio receiver that can be carried in a shirt pocket, yet is designed to provide extensions of several miles for radio systems now operating on the 150 megacycle band
- A miniature magnetic memory unit for electronic computers, capable of storing 1m bits of information in a space little larger than a shoe-box, and of relinquishing any or all of the items in a few millionths of a second.
- A complete television station, including 4lb camera and 15lb back-pack transmitter than can be handily carried by one man and transmits television signals up to a mile to a receiving point for rebroadcast.
- A midget power supply unit for television studio equipment, reducing tube and space requirements by more than 70 per cent, permitting the power needs of a colour TV camera chain to be handled with two small units instead of a full rack of power supplies

FOR THE CONSUMER MARKET

These highlights typify developments occurring on a wide scale in military, industrial and commercial electronics to meet the continuing demand for compact, rugged and economical equipment. It is logical to expect that further advances in miniaturisation will have an increasing effect in the consumer field as well.

In addition to the familiar examples of transistorised

Soldier-scout sends live video pictures to his Command Post with eight-pound TV camera built to Army Signal Corps specifications.



Engineer examines some ultra-miniature transceivers and receivers for commercial and military use, in comparison with a standard U.S. Army helmet in the background.

radios and subminiature hearing aids, there have been subtle changes inside many of the electronic items in the consumer market as a result of miniaturisation in components.

Printed circuits, for example, are finding their way increasingly into radios, television sets and phonographs. Printed on a flat board into which components are inserted, these elements not only save considerable space, but they lend themselves easily to high-speed automatic production techniques that help to lower cost and price.

Then, too, the pocket-size transistorised radio has achieved Lilliputian proportions with the added help of new miniature loudspeakers made possible by improved magnetic materials and design ingenuity.

BREAK-THROUGH IN RESEARCH

Electronic miniaturisation, with all that it implies in new or improved performance and economy, is the direct result of a massive break-through in research during the past two decades. The essence of this break-through is the discovery that, electronically speaking, we have been doing things the hard way.

The operation of every electronic device calls for a supply of electrons whose actions can be controlled in various ways to perform such tasks as amplifying an electrical signal, oscillating to produce radio waves, or sensing and reacting to heat, light or pressure. The electronics industry, until recently, performed its wonders chiefly with supplies of free electrons laboriously "boiled" out of a heated filament in the vacuum tube.

In this process, electric current is supplied in substantial amounts to heat and cathode to the point where its atoms vibrate with enough violence to knock loose a useful quantity of electrons at a useful rate. These emancipated electrons move through the vacuum to an anode, or collector. During their passage, they may be influenced by the charge on a metal grid interposed between the emitter and the collector.

A small effect, such as a little charge, applied to the electron stream at the grid, for example, will be amplified into a far greater effect when the electrons arrive at the collector. From the collector, they are directed through a variety of circuits to the particular job at hand.

This way of handling matters seemed eminently satisfactory until research workers, impelled by a desire for greater compactness and efficiency in electron devices, began exploring possible ways to employ electrons without all the work of expelling them from the cathode into a vacuum

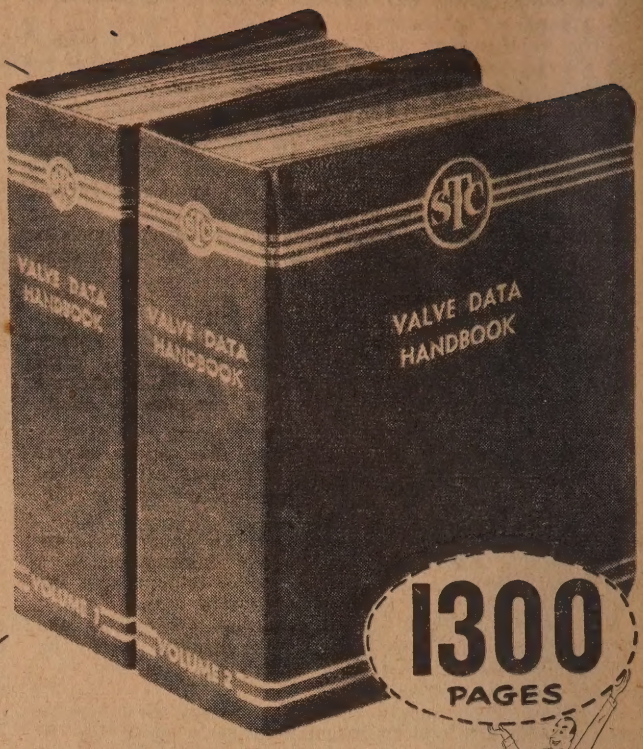
GUIDES FROM THE PAST

For the electronic scientists, there were some guides from the past—notably the use in early radio equipment of certain natural crystals, such as galena, which detected radio signals. The phenomenon was not, however, thoroughly understood at the time. The intensified studies led to greater understanding, and finally to a picture something like this:

The atoms of a crystal are arranged neatly in rows, like trees in an orchard, facilitating the movement of electrons through the material. In certain types of crystals possessing the right environment, it is possible to cause a movement of electrons from one extremity to the other by the application of a small amount of electrical or radiant energy

(Continued on Page 79)

AMAZING BOOK OFFER!



VALVE REFERENCE LIBRARY 35/-

1300 PAGES

Two handsome leatherette-bound binders crammed full of valve technical information, specifications and reports. 1300 pages enclosed in two special loose-leaf binders to allow easy additions of future data to keep these valve Hand Books right up-to-date! An amazing book offer from Standard Telephones and Cables Pty. Ltd

PLUS

300 PAGE BRIMAR RADIO VALVE and TELETUBE MANUAL

This offer also includes a fully illustrated 300 page radio valve and teletube manual with the latest technical details of television and radio valves.

3 YEARS DATA SERVICE—FREE!

Every purchaser receives free, and post free additional data sheets issued every quarter for three years. Convenient locking device permits simple insertion of new sheets.

YOU GET THIS INFORMATION

Comprehensive technical details and application reports describing complete range of STC transmitting and receiving valves, thyratrons, gas-filled tubes, transistors and other miscellaneous specialised electronic devices.

WRITE TO-DAY

Write today for this amazing offer containing information never before published. Available now to you for the unbelievable low price of 35/-. Send your cheque, postal note or money order to Electronics Division.

STC

Standard Telephones and Cables Pty. Ltd.

252-274 Botany Road, Alexandria. MX0444.

an IT&T ASSOCIATE

Please send me your Valve Data Book offer for which I enclose cheque, postal note, money order for 35/- (cross out where not applicable).

Name (in block letters).....

Address.....

.....

State.....

RECORDER WEIGHS UNDER 2 LBS.

No doubt you've heard of miniature wire recorders, small enough to slip into coat pockets, powerful enough to record from 30 feet, compact enough to hold their own batteries and yet so versatile that they run for 2½ hours and feature all the advantages of normal tape recorders.

By PEDR DAVIS

I HAVE one—a German Minifon and as a professional journalist, I find it as big an advance over the typewriter as a typewriter is over a fountain pen.

Fifty minutes ago the .002in. wire spool was bare, now it carries a 3,000-word feature article, ready for transcription.

My use for this miniature recorder is purely as an office dictating machine but its astonishing versatility cannot go unmentioned. This pocket size recorder will:

- Record when connected directly to a radio or record player.
- Operate off the mains, self-contained batteries or car batteries.
- Play back through hand microphone, desk microphone or radio amplifier.
- Record two-way telephone conversations.
- Record surreptitiously through a dummy wrist watch microphone.
- Correct by over-speaking.

The entire unit and batteries is contained in a light alloy case no bigger than a box of 100 cigarettes. The controls are push-button, with STOP, REWIND and RECORD. A tiny hand crystal microphone both records and plays back. Its fidelity on the playback is marred slightly by background noise as the wire runs through the magnetic head, but the reproduction of either the stethoset headphones or transistor desk speaker is faultless. With the combined desk microphone and speaker, the volume possible is amazing.

SELF-CONTAINED

As the photograph shows, the unit is equipped with self-contained batteries, though for normal office use, a small transformer/rectifier (adjustable for different voltages) takes the place of the costly motor battery.

The three batteries consist of a 30-volt anode "hearing aid" battery with a life of 150-200 hours, a 1.4-volt filament, lasting 20-30 hours, and a 12-volt motor battery with a 15-20 hour life. All cells are standard. In addition, there is a tiny battery meter built into the control panel of the recorder showing the condition of the motor battery.

The engineering of the Minifon is immaculate. All moving parts rotate in jewelled bearings and the operation of the motor is inaudible. The recording wire has an indefinite life and is available in different lengths (up to 2½ hours recording time). When the unit reaches the end of the spool, either on the record or playback position, the motor and main battery is automatically cut out and a pilot light signals a warning. These wire spools are readily interchangeable and should the wire snap (a rare occurrence) it can be joined with a simple knot, which passes easily and noiselessly through the magnetic head.

Like magnetic tape, the wire can be erased completely or corrections can be made simply by overspeaking.

There is also a cunningly devised indictator which shows at a glance how many minutes of recording are left on the spool.

Fortunately, surreptitious recordings are out of my line but in this field, the Minifon is without peer. The entire unit weighs only 1lb 11oz and slips into the pocket. The hand microphone can be hidden in the breast pocket of a suit and will record the two-way conversation competently. Alternatively, a highly sensitive microphone built into a dummy wristwatch can be had as an optional extra.

Telephone conversations are also well within the ken of the Minifon. A small adaptor with a rubber suction cup on its base can be plugged to the base of the telephone, close to the coil. Both sides of the conversation are distinctly recorded by induction. Such recordings, in Australia, are of course illegal.

Finally, for use in noisy workshops, road testing motor cars or other occupations, a throat microphone picks up every word of the speaker's voice and elminates all background confusion.

Truly a mighty Minifon!

(A) The complete Minifon tape recorder

THE NEW *RED-BACK* BASF MAGNETOPHONBAND TYPE LGS STANDARD 1200FT. RECORDING TAPE

TAPE CAN'T UNROLL

CARTON-TOP CAN'T BE LOST !

BASF tape comes to you with these features:

- The red-plastic safety clip ensures that the tape won't unroll.
- Each reel is factory-sealed for your safety.
- The clever design carton ensures that the top can't be lost when tape is in use.

BASF, the world's first recording tape, is the choice of the Australian Armed Services and over 90% of Australian radio stations.

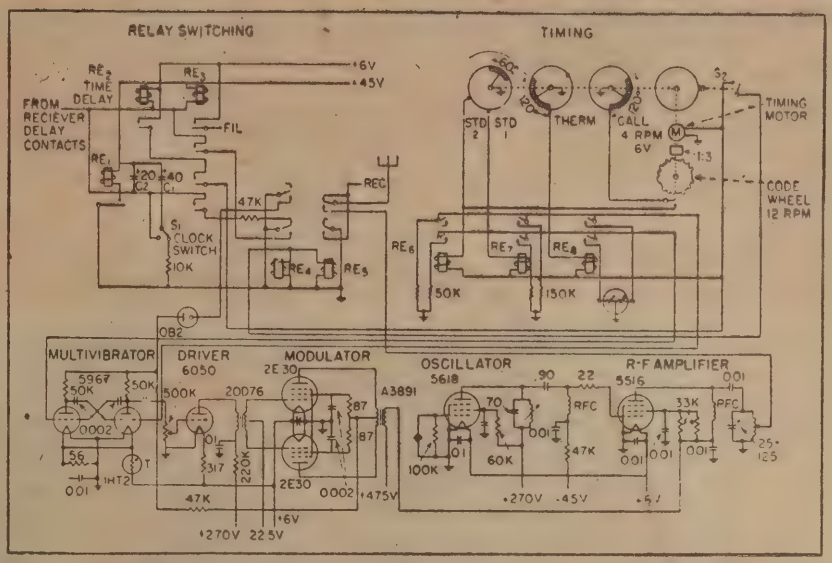
BASF Distributed by Maurice Chapman & Co. Pty. Ltd., 31 Macquarie Place, SYDNEY. BU6401

BUOY TELEMETERS OCEAN DATA

ONE such buoy has been developed containing a receiver, transmitter, measuring and timing equipment. It can be set to transmit temperature data at predetermined times or can be be made to respond to a signal sent out by the base transmitter through the internal low-consumption transistor receiver, which is left operating continuously.

The signal from the buoy, modulated by a thermistor-controlled R-C oscillator, transmits water temperature in terms of the modulation frequency.

A crystal oscillator designed to operate in the 2 to 3 megacycle range drives a single-ended plate modulated power amplifier in the transmitter unit. Fast-heating filament-type valves are used to minimise warm-up time and consequent battery drain. Input power to the final is approximately 30 watts.



Relay switching unit and timing motor control operation of telemetering transmitter to broadcast standard tones, temperature tone and identifying code signal.

Increasing cost of operating oceanographic vessels emphasises the need for a method of making semicontinuous measurements at many different locations independently of the ship. Telemetering anchored buoys can provide measurements of surface or deep temperatures, or when allowed to drift can provide ocean current and circulation data.

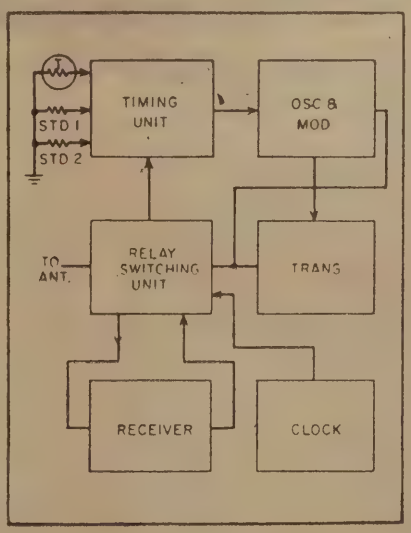
The accuracy of temperature measurements is dependent upon the frequency stability of the multivibrator which generates the modulation frequency. The maximum error is plus or minus 0.2 degrees centigrade.

Overall, the transmitter modulator consists of the multivibrator, driver and push-pull modulator, all of conventional design. The frequency of oscillation of the multivibrator is controlled by the grid resistors. Precision, low temperature co-efficient resistors are used to establish the two standard tones, whose frequencies correspond to the upper and lower extremes of the thermistor range. Thus a means is provided to detect frequency drift caused by decay of the battery supply voltages. Both the plate voltage and filament current of the multivibrator are regulated to ensure maximum frequency stability with supply voltage variation.

LOW BATTERY DRAIN

Since the receiver must run continuously during the life of the buoy the most important consideration is low battery drain. It employs nine transistors in a superhet circuit. To achieve the high sensitivity required for long-range operation, a stage of RF amplifications and two stages of IF amplification are included.

All stages through to the second detector are surface barrier transistors chosen for their high frequency response and low power consumption. The transistor push-pull, class B output stage drives a resonant-reed relay. No forward emitter bias is used in this amplifier, since distortion of the output stage does not materially affect operation of the relay. Power consumption of the output stage is thus negligible in the absence of an input signal. The resonant-reed relay contacts are in series with a sensitive DC relay shunted by a capacitor.



All sections of telemetering buoy are controlled by relay switching unit.

The buoy has been reliably triggered and read at ranges up to 300 miles at frequencies between 2 and 3 megacycles. This range has been increased to as much as 600 miles by triggering at times of optimum propagation.

In operation, a number of buoys are anchored at locations determined by the physical problem to be investigated. The buoys transmit and receive on the same frequency, but each buoy responds to an interrogating signal only if the signal is modulated with a tone of particular frequency.

QUICK HEATERS

Vibrating reed relays are used in the output of the buoy receivers to obtain a narrow audio frequency response that almost entirely eliminates accidental transmission caused by noise and interference. The interrogating transmitter is modulated by tones derived from a resonant reed controlled oscillator with a separate resonant reed for each tone.

The reception of the proper tone by the buoy receiver actuates a time relay which allows quick heating transmitter filaments five seconds warmup time. The transmitter is then keyed with the call sign followed by the three consecutive tones.

The total transmission lasts 15 seconds. At two transmissions per day the estimated battery life is about two months. The FM/AM signal is received on a standard communications receiver and recorded on magnetic tape. The tone frequencies are then measured. In the event of garbled reception the buoy may be triggered again at a more favourable time.

A NEW STANDARD IN
High-Fidelity Record Players
PHILIPS AG 2005

with

I.M.D.*

*(Integrated Mechanical Design)

There is an optimum physical and mechanical relationship between all moving parts of a record player (e.g., between turntable weight and bearing size, and motor power, etc.), and these must be designed and manufactured with precision. The exceptional reproduction of this player is directly attributable not only to its many unique features, but also to the utilisation of I.M.D. in every phase of design and manufacture. (Refer to "Hi-Fi from Microphone to Ear"—G. Slot.)

PHILIPS

CHECK THESE UNIQUE FEATURES:

1 *Philips magneto-dynamic, high-fidelity pick-up heads of completely new design, with low inertia ferroxdure armature. Frequency response, 10-20,000 c/s within 1 dB, low compliance 5 x 10^{-6} cm/dyne.*

2 *Built-in speed control/selector and illuminated stroboscope enabling the setting of accurate nominal turntable speed. Variation ± 4% produced by an eddy current brake.*

3 *During the playing cycle the pick-up arm mechanism is completely disengaged, leading to less record wear.*

4 *Push-button operation.*

5 *Dynamically balanced turntable and motor armature.*
- *Built-in muting switch.*
- *Automatic electromagnetic release of idler wheel.*
- *Wow and flutter—better than 0.3% at 33⅓ r.p.m.*
- *Rumble—better than —40 dB. (NARTB).*

ela

electro-acoustic division of
PHILIPS ELECTRICAL INDUSTRIES
PTY. LIMITED
SYDNEY: 367 Kent Street.
MELBOURNE: 590 Bourke Street.
BRISBANE: 148 Edward Street.
ADELAIDE: 119 Grenfell Street
PERTH: 381-5 Murray Street.
HOBART: 235 Collins Street.

(Obtainable from your usual supplier) **Price 55 gns.**

Please send me further information on the AG 2005 High Fidelity Record Player.

NAME .....

ADDRESS .....

..... (block letters)

FILL AND POST TO YOUR LOCAL PHILIPS BRANCH

PGR3-57

DENTIST'S CLOSED-CIRCUIT TV

The largest dental college in the United States is using closed-circuit television as a new teaching medium to speed instruction and to keep abreast of the changing profession. Through use of the new teaching medium, New York University's College of Dentistry hopes to broaden subject courses within the currently heavy curriculum. Thus, students will be apprised immediately of rapidly changing dental practices without need for additional courses.

Shown here is a class of more than 70 dental students during a televised lecture. The lecturers explain the dental techniques while studio professors televise the demonstration.

ACCORDING to the dean, Dr. Raymond Nagle, he has already noted a saving of 5½ hours in the teaching of one particular course.

In this instance, about 20 minutes were expended to demonstrate and lecture to 70 students in the fundamentals of filling a tooth. Under previous methods, the course would of necessity have to be taught to the students in groups of six or seven, or as many as were able to group around a professor at a dental chair.

In this fashion, each instructional period would have required about 35 minutes. Thus, the complete class of 70 students, taught in groups of seven each, would have required a total of 350 minutes of instruction, as against the 20 minutes by TV for the entire class.

The 5½ hours thus saved can now be devoted to laboratory classes or for additional instruction in other dental practices. In addition, details which were previously hurried over can now be emphasised.

What about attention to instruction and retention of learning? "Excellent," says Dr. Nagle. During this particular instruction and lecture, the 70 students, seated comfortably in front of two 21-inch TV receivers, were "so quiet you could hear a pin drop." Examinations following the lecture—anywhere from one day to one week after—disclosed that students had been very perceptive and receptive to the lecture and televised demonstration.

How does this teaching method compare with use of educational films and other visual aids? Dr. Nagle explains that "television is immediate while instructional films of the rapidly-changing dental profession are obsolete almost before they can be produced."

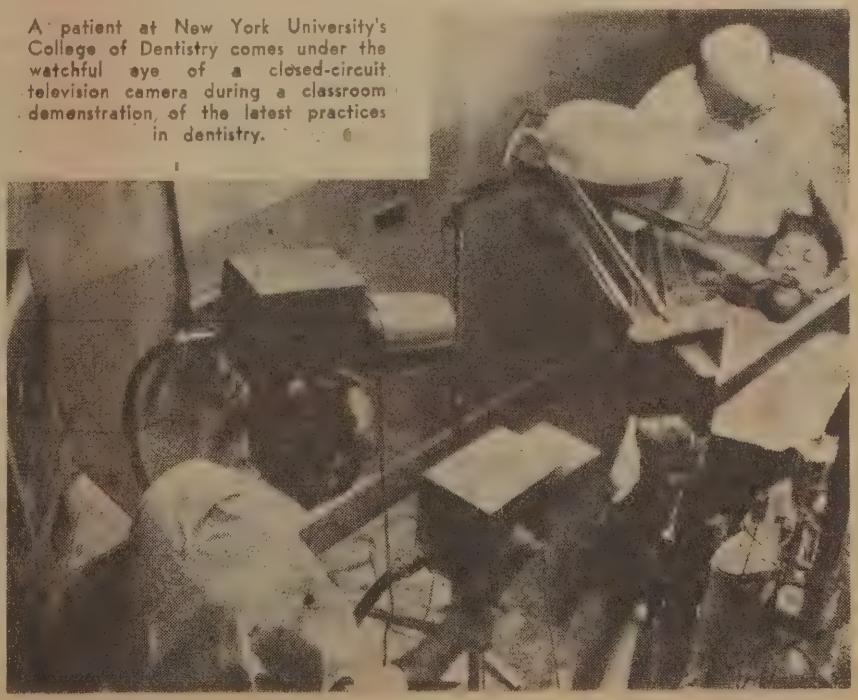
For instance, Dr. Nagle continued, a new therapeutic treatment of today may be outmoded within a year by newly-discovered and more efficient methods. Thus, the many months required to put the film together are practically written off before the film is ready for shooting.

The lecturers readily admit they are not yet television experts but say they are daily improving their camera techniques. They are keeping records of new lighting techniques and camera angles in order to provide future advice and information to other dental educators as they become interested in teaching by closed-circuit television.

For instance, they have found that 21-inch receivers are the most effective for viewing. Larger screens, they believe, would lose much of the necessary clarity and detail for accurate perception.

Demonstrations are televised from a central studio at the college and "piped" into several lecture halls on various floors of the building. Two General Electric TV cameras are used in the studio; one equipped with a wide-angle lens for overall viewing; the other with a Perkin-Elmer variable focal length Zoom lens.

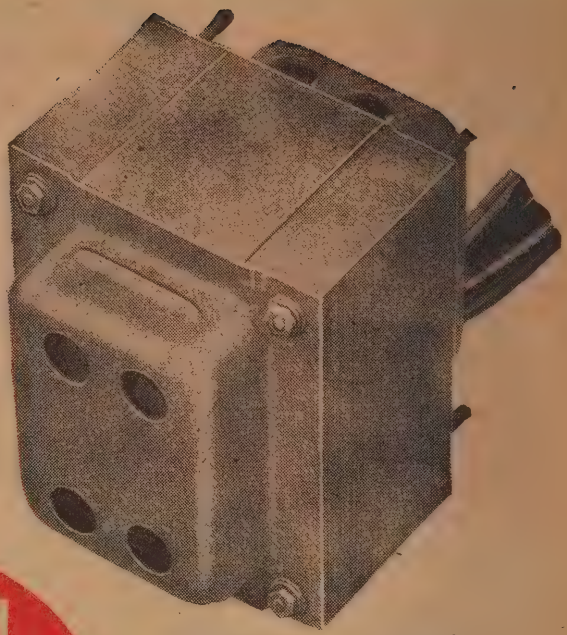
A patient at New York University's College of Dentistry comes under the watchful eye of a closed-circuit television camera during a classroom demonstration of the latest practices in dentistry.



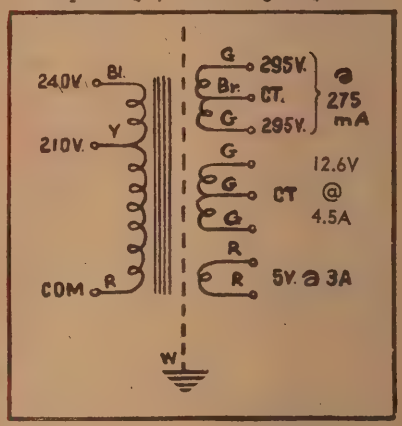
For "Radio Television & Hobbies"

17" TV RECEIVER

specify—



TRANSFORMER RH275/295
Dimensions (upright mounting)
4½in x 3¾in, chassis height 4¼in.



National POWER TV TRANSFORMER

RH275/295

for these 8 reasons—

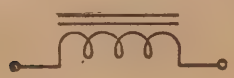
PRODUCTION FACILITIES

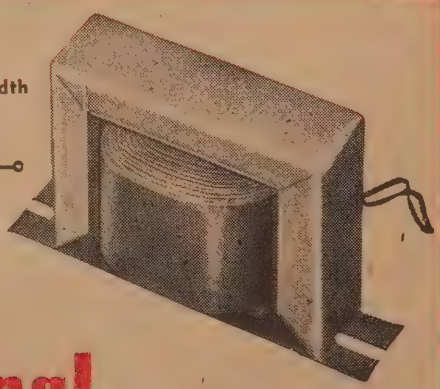
1. NATIONAL is the largest T.V. transformer manufacturer in the Commonwealth with a modern, mass production factory capable of supplying the full requirements of T.V. Quality controls ensure uniformity of production in each particular line. NATIONAL'S experience and specialised development benefit Manufacturers.

TECHNICAL FEATURES

2. Designed to operate at low flux density thus reducing interference in picture tube.
3. Electrostatic shield between primary and secondary minimise line pick-up.
4. Fitted with copper strapping to reduce external field.
5. "Rolled-edge" holes in cover prevent chafing of leads.
6. Unique lead-anchoring inside the core prevents leads being pulled out.
7. Air-cooled scientifically. Louvres and vents in the cover provide maximum cooling.
8. Low temperature rise reduces the ambient of the T.V. receiver chassis.

CHOKE RH1/275
Dimensions:
3⅛" x 2⅝" x 2" coil width





Specify

National RH1/275 TV CHOKE

for the same Receiver

- Inductance—1 Henry.
- Current Rating—275mA.
- Fitted with easy mount clamps.

Contact your usual supplier for full details . . . NOW

AUSTRALIAN AND OVERSEAS AGENTS.

Wm. J. McLELLAN & CO. PTY. LTD.

126 Sussex St., Sydney. BX1131 (50 yards nth. of King St.)

GIANT REFLECTOR AT JODRELL BANK

RADIO TELESCOPE TAKES SHAPE

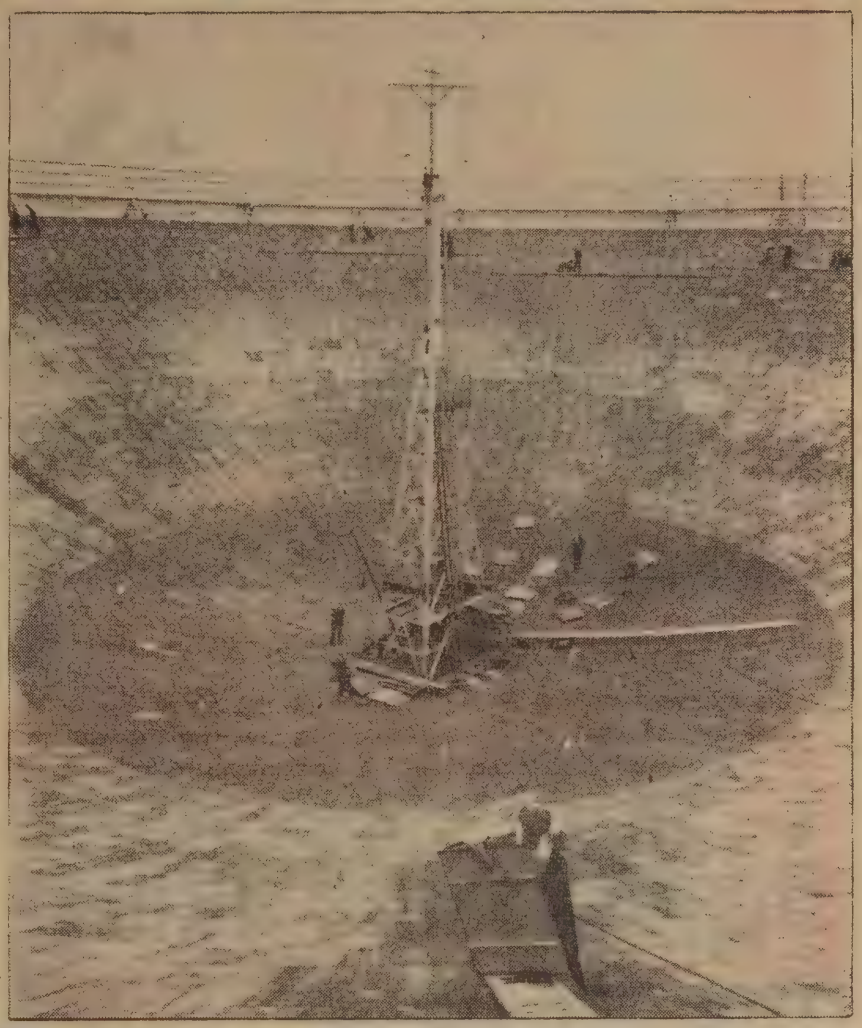
At Jodrell Bank, in Cheshire, England, is being built a giant radio Telescope for the University of Manchester which will be used to detect radio waves emanating from the stars

THE telescope, claimed to be the largest in the world, weighs 2000 tons, and despite its great weight, is easily and competely steerable so that it can be cocked like a giant ear to any part of the sky.

The maximum height of the telescope is 300 ft and the reflector bowl, in the centre of which is the aerial, weighs 750 tons.

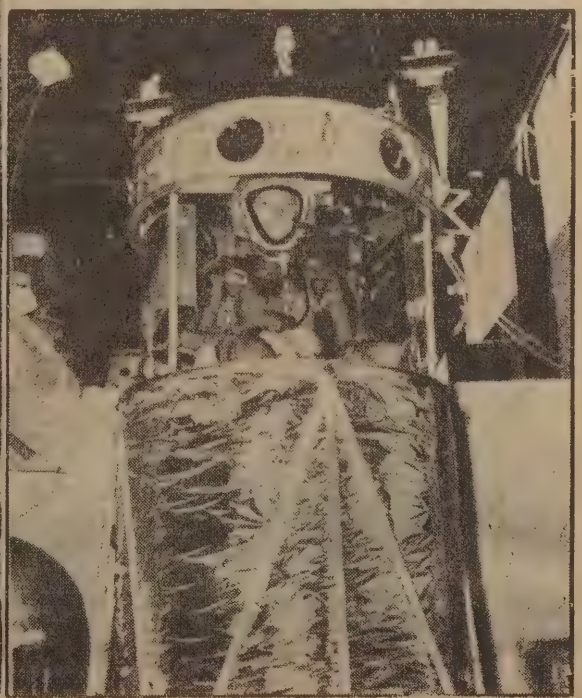
The bowl concentrates the signals received over its area on the aerial array, thus giving very high gain and directivity.

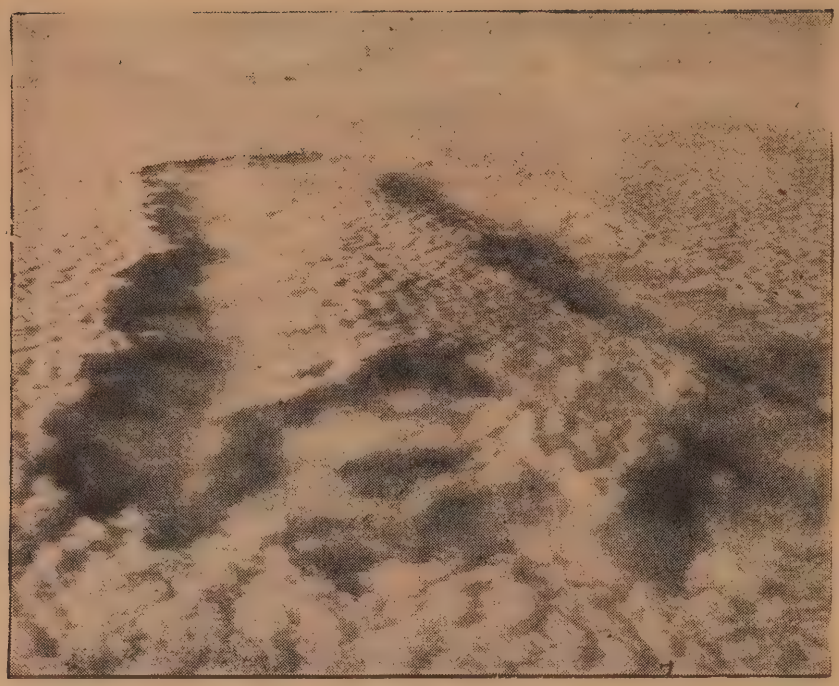
The telescope will be of immense value to scientific research, for astronomers will be able to detect "radio" stars from greater distances, and measure their position more accurately. It can also be used for checking radiations from the sun.



Below—Tiny silicon wafers, or solar batteries, grouped in long narrow clusters on the crown of the U.S. soldiers helmet can provide all the electrical power needed to operate his transmitter-receiver. Teamed with small, nickel-cadmium storage batteries for peak power and night-time operation, the cells provide current for as much as a year's as compared with dry cells the life of which is measured in hours.

Below—This U.S. Air Force airman hopes to reach 95,000ft in hours with a record balloon flight





A dramatic cloud picture showing the wake of a seeded aircraft engaged in rain-making experiments.

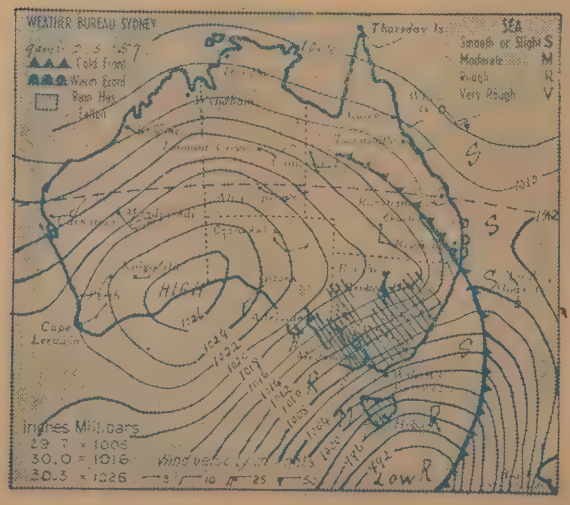
By CALVIN WALTERS

The constant change in the pressure of the air on the surface of the earth is responsible for variations of weather. This article shows how the movement of "highs" and "lows" affects Australian conditions. Figure numbers refer to maps in order of date.

Air Pressure And The Weather

THE drought conditions recently prevailing over the Australian continent caused more people than usual to take an interest in the daily weather reports which are given over the radio and in the newspapers.

Unfortunately these reports do not give an adequate idea of the causes of the weather conditions beyond the bare statement that a "high pressure system at present centred over N.S.W. is bringing continuing fine weather."



Of course there are all sorts of arguments going on in trains, cafes, offices and farms as to the cause of the drought.

Many people blame the atom and hydrogen tests of course. That is to be expected. Anything of an unusual nature is always blamed by somebody as being the cause of something or other and the atom bomb or as it is more politely called the nuclear tests, is the popular victim at present.

We have had severe floods in the past few years. The atom bomb was blamed for that. We had severe heatwaves. Atom bombs again. We had big snowstorms in various places. Atom bomb again.

Thus the atom bomb becomes the most versatile cause of all the troubles which have beset mankind since the first one was let off over Hiroshima. It causes apparently anything from the insane actions of politicians, the trains being always late on N.S.W. railways, floods, droughts, heatwaves, coldwaves, behaviour of bodgies, births of four-legged babies and two legged calves and now we await the news that it is the cause of the Singapore influenza.

BLAME THE SUNSPOTS

The same was said about sunspots and this is still a popular theme with long-range forecasters, although nobody has yet explained why a sunspot 93 millions of miles away can pick out such a small area of the earth's surface as say New South Wales to cause a flood or a drought while the opposite conditions prevail a few hundred miles away in a neighbouring State.

There may be something in all this I couldn't say. What goes on "up there" is anybody's business and jolly hard to find out.

The fact of the matter is that we have been having the same sort of weather conditions on and off since weather conditions have been recorded, and as far as we know they are governed by variations of the pressure systems over the earth's surface.

As a matter of fact it is these pressure systems together with temperature and other readings upon which weather forecasts are based. And they are more accurate over a period than most people seem to imagine despite the belting that the poor old weather man gets from time to time.

FORECAST ACCURACY

What sort of belting he gets seems to depend on whether he is a Government man or a private forecaster. It seems to be an inherent trait of human nature to publicise the failures of a Government institution more than the successes whilst publicising the successes of the private forecaster and forgetting his failures.

I propose to leave it at that before I start getting into strife myself. I don't know of a more controversial subject. I bet even now there are fellows starting to write letters before they even read what is to follow.

Our atmosphere lies like a blanket over the earth. It is four-fifths nitrogen. The other fifth is mostly oxygen with carbon dioxide and water vapour and a few other gases in traces.

The force of gravity prevents the atmosphere from streaming off into space. Thus it has weight so that there is a column of air weighing about half a ton resting on our heads.

The actual height of the atmosphere above the earth has not been proved but it is known that appreciable amounts exist 600 miles up. Nevertheless more than half the weight of the atmosphere is contained in the layer of air below a level of 20,000 feet.

It has been estimated by Gordon Cook that for every million gas particles in the air at sea level there is only one at a height of 60 miles.

Whilst a particle of air at sea level is separated from its neighbour by only a few millionths of an inch, at a height of 800 miles they are separated from each other by a distance of 2,000 miles.

Air is subject to the influence of the heat of the sun and the cooling effects of the polar caps. It becomes lighter when heated and rises. When cooled it becomes heavier and falls.

The temperature of the air varies with height. It falls in temperature as we rise and at seven miles high it is minus 67 degrees Fahrenheit. This is the height of the lower level of the atmosphere called the troposphere.

Above this is the stratosphere where the air is calm. There are no clouds or storms, very little dust. It is crisp, dry and clear for there is little water vapour.

As we rise higher into the stratosphere to a height of 30 miles the air becomes warmer and reaches a temperature of 170 degrees Fahrenheit. At a height of 50 miles the air becomes cold again dropping to minus 117 degrees.

Whilst the air is calm in the lower levels of the stratosphere there are very violent winds in the upper layers. Above 50 miles high the winds move eastwards at speeds of up to 300 miles an hour. These are the jet streams, recently discovered during the war.

THE TROPOSPHERE

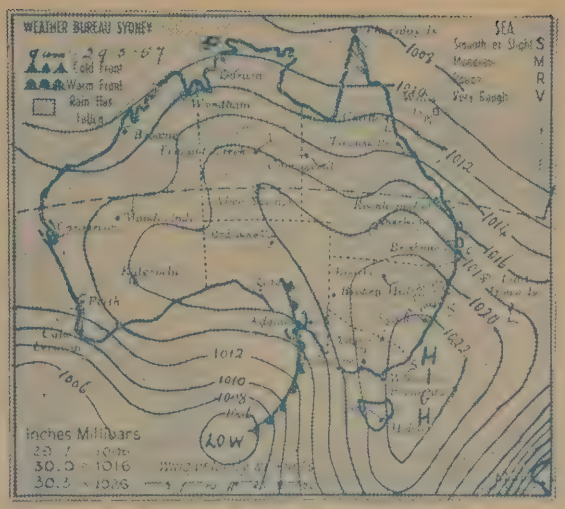
The troposphere is the layer of air which mostly concerns us as it is here that our weather is formed. It is the home of water vapour which forms clouds and gives rain. It transports the water vapour from one place to another. Its jet streams by undulating back and forth from the equator to the pole cause out of season variations in the weather such as heat waves in early winter and snow or frost in spring.

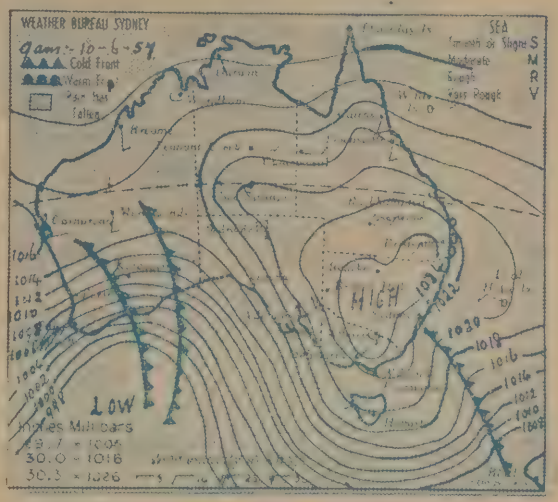
During the winter the jet stream surrounds the earth over the Tropic of Cancer then it moves northward during the summer towards the Arctic Circle. It moves faster in winter than in summer.

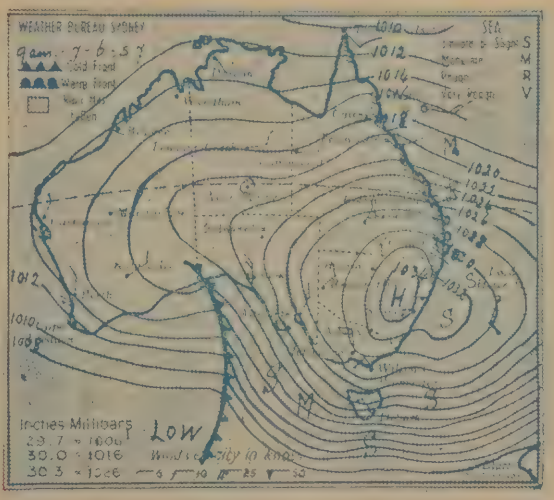
However it is not always steady and sometimes wanders about like a snake firstly travelling towards the equator for a few thousand miles. Then it curves upward to the poles then down and up again along the outskirts of the cold air near the pole.

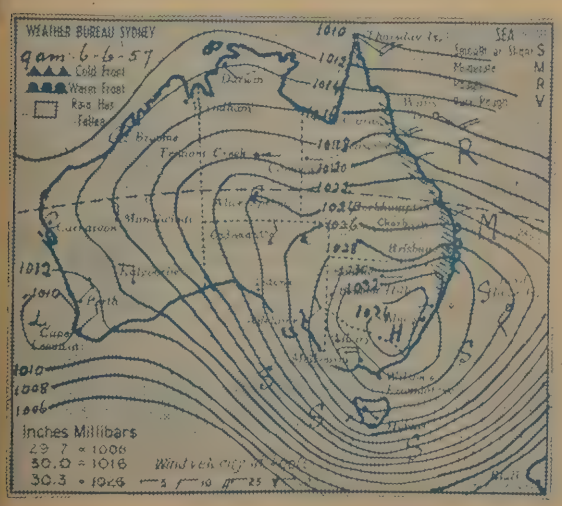
During this up and down meandering the jet stream causes great disturbances in the air. It drags vast quantities of cool polar air downwards towards the equator and at the same time drags warm air upwards towards the pole. Having done this for perhaps a few weeks it returns to its normal course in a more direct route round the earth. Thus it cuts across these huge tongues of cold and warm air which it switched around and leaves them lying over vast areas of land below.

It is no wonder then that the jet stream when it gets "off course" causes great changes in the weather—changes which are evident as sudden drifts from summer to winter or vice versa. Scientists are becoming more and more convinced that it is the









jet stream which contains the clue to better forecasting. When more is learned about its behaviour and more efficient means are found for tracking its movements then our weather forecasting will have reached a higher peak in accuracy.

So we see that during the course of a year the atmosphere is subjected to great strains and stresses which keep it in a contant state of movement. It is heated at the tropics and cooled over the poles. The earth during its revolution drags the air with it. The uneven warming and cooling of the land and water below the air cools or warms the air at land levels at an uneven rate causing uneven contraction or expansion. Water evaporates and the vapour soaks into the air, being carried to great heights and over long distances. The jet stream agitates the air and drags it across equator and pole.

JUST OFF THE PRESS!

This book has been prepared as a comprehensive basic text on modern Alnico Permanent Magnets. It is a practical guide to the design of magnetic circuits employing the latest high energy Alnico alloys.

Contents include:

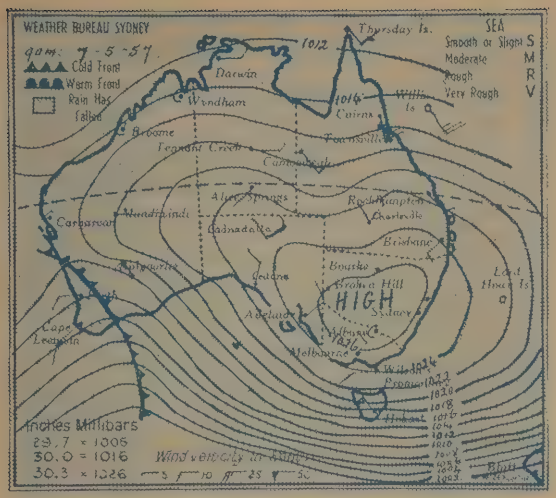
- ELECTRON THEORY OF MAGNETISM
- MAGNETIC ANISOTROPY
- MAGNET APPLICATIONS AND USES
- BASIC MAGNET CONSTRUCTIONS
- MAGNETIC AND PHYSICAL PROPERTIES
- DESIGN OF MAGNETIC CIRCUITS
- TESTING OF MAGNETS
- MAGNETISING AND DE-MAGNETISING
- GLOSSARY OF TERMS AND SYMBOLS

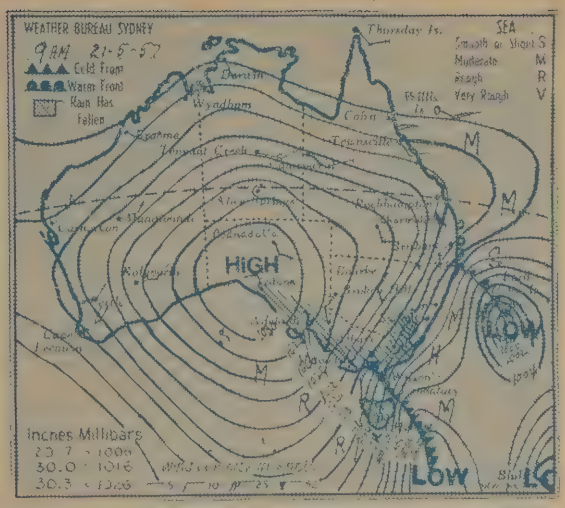
5/-

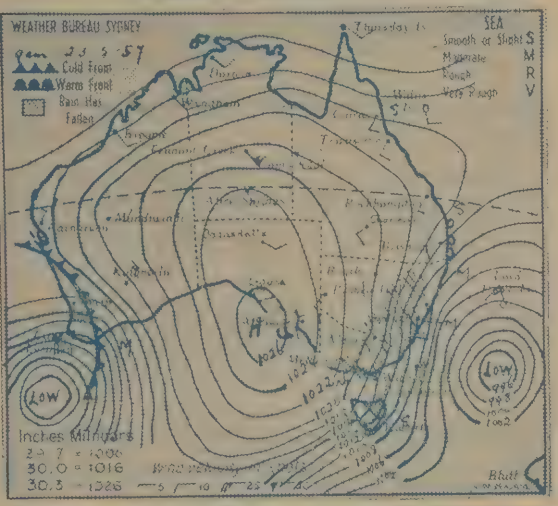
POST FREE

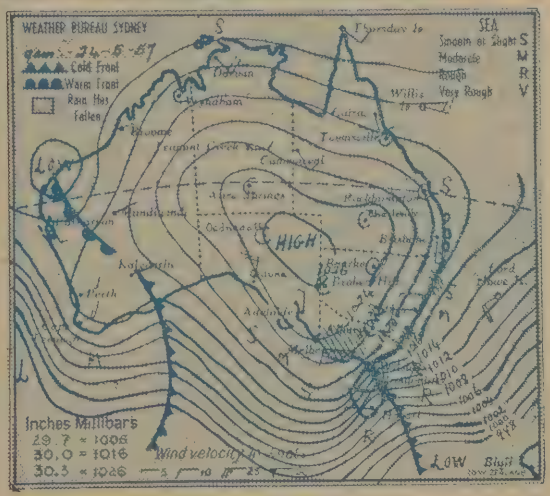
ROLA COMPANY (AUST.) PTY. LTD.

THE BOULEVARD, RICHMOND, E.1, VICTORIA









The result of all this is the creation of enormous whirlpools in the air which are carried in a fairly regular pattern across the surface of the earth.

These whirlpools have been studied for centuries and the courses mapped so that with the measurements of pressure, temperature and other factors they have become the basis of the weather maps published in our daily newspapers.

If you glance at the map of Fig. 1 you will see that there are a series of concentric lines in three places. To the left near Cape Leeuwin the lines have "Low" in the centre. At the centre of the Great Australian Bight is a larger series having "High" at the centre. Off the East Coast of the continent there is another "Low" series.

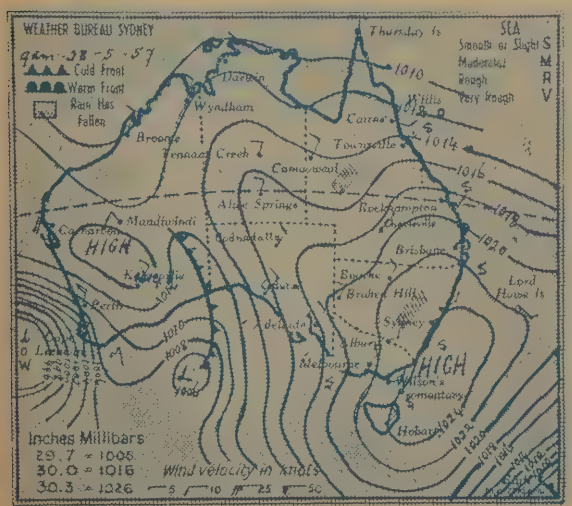
These lines are drawn through places where the weight of the air above is equal. This is measured with a barometer and is called the pressure.

The wind direction is given by means of arrows drawn between the lines. It will be noticed that the arrows point outwards away from the centre of a "High" and inwards TOWARDS the centre of a "Low".

ISOBARS AND MILLIBARS

The concentric lines are called Isobars and each is marked with the pressure in millibars. Note that the pressure gets lower towards the centre of a Low and higher towards the centre of a High. The winds blow outward away from the centre of a High and revolve in an anti-clockwise direction as shown by the small arrows. In a Low pressure the winds flow towards the centre of the Low and revolve in a clockwise direction. In other words the air behaves the same as water and flows away from regions of high pressure towards regions of low pressure. It is like opening a valve in the tank of air at a service station to fill your car tyres. The air in the tank is at a higher pressure and flows into the low pressure area of the tyre.

When the air pressure as measured on the barometer rises or falls rapidly between places fairly close together it causes the lines on the map to be tightly packed. This is shown nicely between the two Lows and the High of Fig. 1. In these areas the winds are very strong and may reach hurricane force.

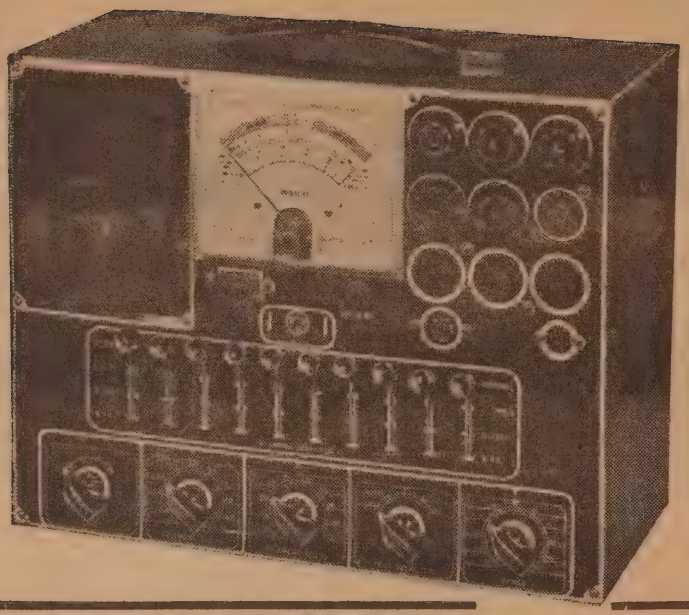


In areas under the influence of the High pressure or ANTI-CYCLONE the air is flowing outwards and downwards carrying moisture away. Thus the weather is fine and the sky cloudless. The nights are usually cool and the day warm.

In areas under the influence of a Low or cyclone the air is flowing inwards and upwards carrying with it the water vapour which condenses into cloud. The air is muggy and oppressive and there is a tendency for rain to fall if other conditions for condensation are right.

Therefore it is to the Low pressure system that we look when we want rain and unless such a system is present rain will not fall. During the winter month the High pressure systems move across Australia in higher lattitudes so that their centres usually cross the continent somewhere about or above the "dead heart."

Continued on Page 119.



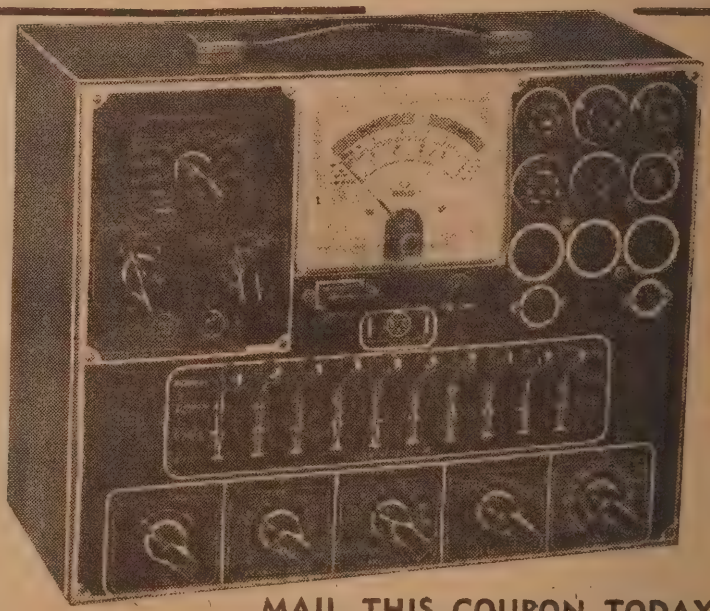
VALVE TESTER MODEL TVT.

This is the latest in valve testers and is flexible over a very wide range allowing all types of tubes to be tested irrespective of their pin connections. Individual lever switches are used for every pin, and a range of twenty filament voltages allow all types of tubes to be tested quickly and accurately. It is designed for ordinary radio use as well as for testing TV tubes, and can be used as a portable instrument or bench instrument.

TWO FAMOUS UNIVERSITY
RADIO/T.V. TEST INSTRUMENTS

VALVE AND CIRCUIT TESTER MODEL TST/2

The Model TST needs no introduction to the radio and TV service industry in Australia, and Model TST/2 is built on the same basic principles of good quality and lasting service, but with improvements to allow testing of TV tubes and to give it a more flexible range than TST. As well as having all the features of Model TVT valve tester, it allows AC/DC and output voltages to be checked up to 1,000 volts. together with a range of D.C. current up to 250 milliamperes and self-contained resistance ranges up to 10 megohm. Designed to operate from A.C. it is supplied with instruction booklet and test leads.



MAIL THIS COUPON TODAY!

UNIVERSITY GRAHAM INSTRUMENTS PTY. LTD.

5 NORTH YORK ST.,
SYDNEY. BU3169.

MAIL THIS COUPON TO:
UNIVERSITY GRAHAM INSTRUMENTS PTY. LTD.
5 North York Street, Sydney. 'Phone BU3169.

Please send me details of .....

NAME .....

ADDRESS .....

.....

Technical Review

NEW NOISE GATING TUBE DOES MULTIPLE DUTY IN TV

An interesting description of the new type 6BU8 released overseas is contained in this article from "Electronics." The entire functions of sync clipping and generating AGC voltage are combined with a high degree of noise immunity. The valve contains a common cathode, grid and screen with separate plates and number three grids.

NOISE gating—discriminating against noise pulses on the basis of their amplitude — is combined in the system to be described with a good sync clipper and AGC circuit in simple form.

The effect of impulse noise on automatic gain control and sync separating circuits can best be considered by first examining a simple unprotected circuit such as that of Fig. 1. One triode is employed as a self-biased sync clipper. Another triode is used for automatic gain control of the RF and IF amplifiers of the receiver in response to the output of the video amplifier.

The video amplifier output has positive-going sync and includes the DC component of the composite video signal. A portion of this output is applied to the AGC tube grid, by a resistive divider. The grid is biased beyond cutoff by the positive potential of the cathode. The AGC delay control setting determines the level at which the video amplifier output will stabilise.

A resistive divider between anode and high negative supply of 75 volts provides zero or a slightly positive voltage at the AGC output and establishes the no-signal anode potential. With signal the anode draws current, its DC potential falls, causing the AGC control point to go negative and thus reduce the receiver gain. The positive-going sync pulses of a signal of moderate strength extend to about the centre of the grid-control characteristic.

A portion of the video output is applied through a coupling capacitor to the grid of the sync clipper triode. The sync output amplitude is limited by the low plate voltage provided. The depth of clipping is determined by the grid leak resistance and by the amplitude of the applied signal. The clipped sync output goes through suitable networks to the vertical and horizontal synchronising circuits.

Noise will cause havoc in such an unprotected circuit. Noise pulses are generally of greater amplitude than sync pulses and produce plate current pulses over twice as large as the sync pulses; they can bias the AGC severely.

In the sync clipper output the noise pulses are as large as the sync pulses. With high noise levels the grid coupling capacitor may charge up and cause complete loss of sync for a period following a noise pulse until normal bias is restored.

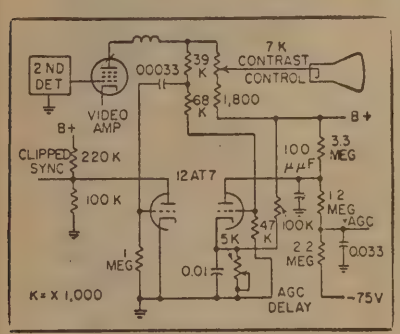


Fig. 1: Simple unprotected circuit for AGC and sync output separation.

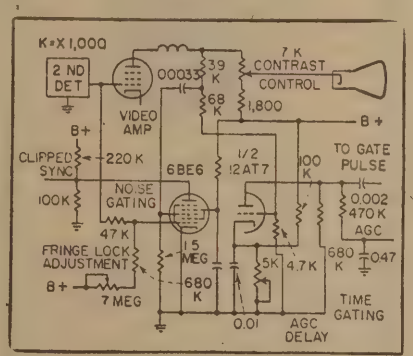


Fig. 2: Impulse noise is time gated but vertical sync output suffers.

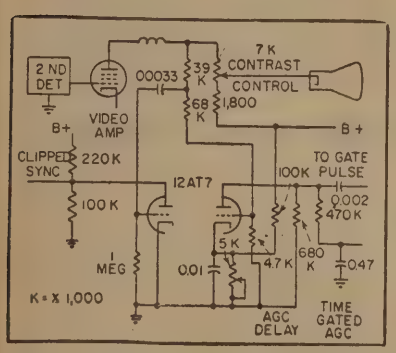


Fig. 3: Triode clipper replaced with pentagrid tube in amplitude gating.

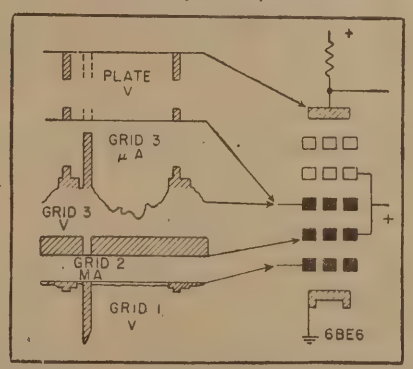


Fig. 4: Relations at various tube electrodes for circuit of Fig. 3.

TIME GATED AGC

One system that has been used with reasonable success to reduce the effect of impulse noise is the time gated AGC shown in Fig 2. Time gating means turning the AGC tube on only during the brief interval when it is needed. Since the triode must conduct current only during the horizontal sync pulse, it is turned on a short period before the occurrence of the sync pulse and turned off soon afterwards.

This action prevents any anode current in response to noise for the periods between gating intervals. Since the gate pulse is taken from the horizontal sweep circuits, these circuits must be in synchronism before the AGC can produce the proper receiver gain and contrast level. In the circuit shown in Fig 2 the triode is operated as a gated diode, with the AGC voltage produced by rectification of the gate pulse.

Such a circuit gains a certain degree of noise protection for the AGC. But for the sync clipper, time gating proves impractical. Vertical sync output would suffer. Pull-in of the horizontal sweep would be slow, since until synchronism is established there is no output.

If time gating is not suitable for a sync clipper circuit, amplitude gating can prove useful. Noise pulses, if they are large enough to impair reception,

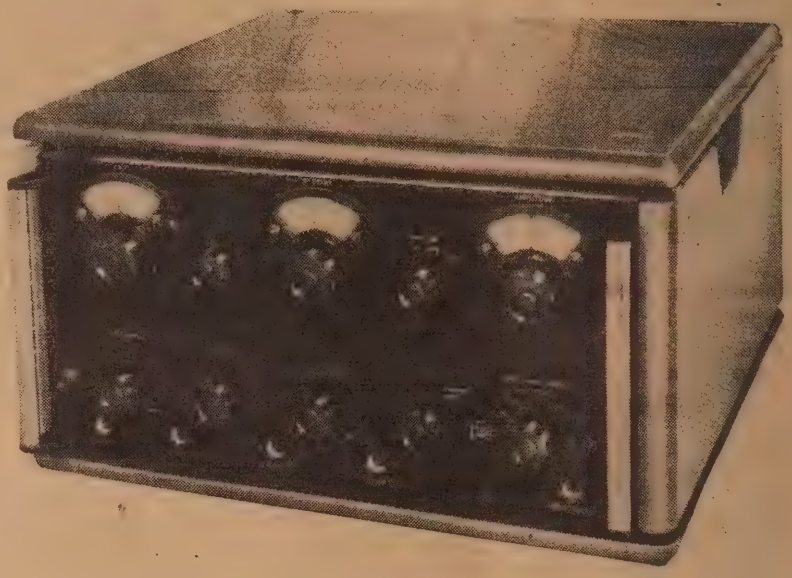
from the new Mullard catalogue

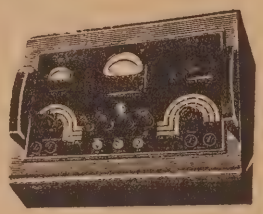
Precision pulse Generator
L141

The pulse generator type L.141 provides two main pulses with accurately controllable amplitude, duration, p.r.f., and separation, together with additional pulses for triggerring or synchronising.

The amplitude of the two main pulses is continuously variable between 300μV and 100V, their duration from 0.5 to 100μs, and the separation between them from 0 to 100 ms.

An internal oscillator provides repetition frequencies from 1c/s to 100kc/s.



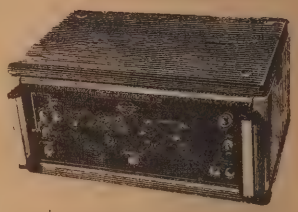


Transistor Tester
L264

The Mullard Transistor Tester has been developed to provide a rapid means of checking general characteristics and ascertaining if a transistor has been damaged in circuit. Facilities for measuring the important parameters, á, base-collector short-circuit current gain, as well as Icó and the collector turnover voltage are provided. Although designed as a simple testing unit, it has an accuracy of ±5%.

Dual Trace Oscilloscope
L101/2

This high grade, general purpose instrument incorporates two identical amplifiers with sensitivities of 20mV/cm over a bandwidth of 4Mc/s. Voltage measurements (±5%) and time measurements (±10%) are by null methods. The time base may be free running or triggered, and sweep speeds are from 0.1μs/cm to 10ms/cm.



Television Line Selector
L196

The L.196 enables any normally triggered oscilloscope to give a jitter-free display of one or more lines from a television video signal. It can be used on transmitter and receiver units to display depth of modulation, d.c. levels, bandwidth, blanking, synchronizing pulses and for the examination of similar waveforms in detail.

Mullard

MULLARD-AUSTRALIA PTY. LTD., 35-43 CLARENCE STREET, SYDNEY BX 2006. 592 BOURKE STREET, MELBOURNE. MU 2366

ASSOCIATED WITH MULLARD LIMITED LONDON MULLARD OVERSEAS LIMITED

M43

generally show a greater amplitude than the sync tips and a number of circuits have been devised to utilise this difference.

In Fig. 3 the triode clipper is replaced with a pentagrid tube such as the 6BE6. The sync clipper grid is grid 3. The anode is operated at a low voltage through a resistive divider to limit the sync output amplitude. The output of the second detector is applied through a 47,000-ohm series resistor to grid 1.

This grid is made to operate near zero bias by connecting it through a high resistance to a positive potential. As a result, considerable grid current flows, reducing the resistance between grid and cathode to a few thousand ohms. Video and sync portions of the signal, applied through the 47,000-ohm resistor, are nearly shorted out and have little effect on the anode current.

ACTION ON NOISE

During negative noise pulses, however, the grid current is reduced to zero, the short-circuit is removed and a pulse of sufficient amplitude will easily cut the tube off as indicated in Fig. 4. A positive replica of a noise pulse appears simultaneously at the clipper grid 3 but it is rendered harmless since there is no current available for the duration of the pulse.

Strictly speaking, a slight disturbance may come through, because noise pulses do not rise or fall with infinite speed and there is an intermediate region where grid 3 is already turned on and grid 1 not yet cut off. For this reason a brief transient appears at the beginning and at the end of each noise pulse. In practice these transients are too short to cause significant harm.

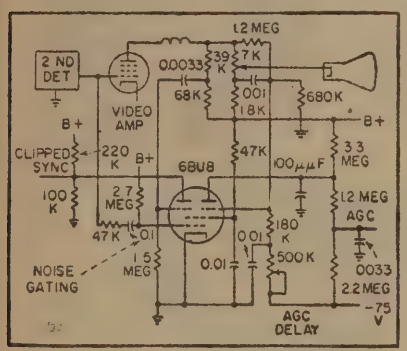


Fig. 7: New type 6BU8 tube simplifies circuit shown in Fig 5.

For maximum noise protection, noise pulses should be gated out slightly beyond the sync tips. The gating level is made adjustable by the so-called fringe lock control, which varies the amount of grid current flowing into grid 1. For weak fringe area signals maximum protection is desired; this corresponds to a maximum resistance position of the control.

However, for moderately strong signals, such a setting gives rise to an instability that has been dubbed split-phase hang-up. To avoid this, the noise gating level must be raised somewhat, corresponding to a lower resistance position of the fringe lock control.

Split-phase hang-up can be traced to the use of an amplitude-gated sync clipper in combination with a time-gated automatic gain control. For example, if the channel selector is switched from a weak to a strong signal, the AGC and clipper circuits will sometimes find a

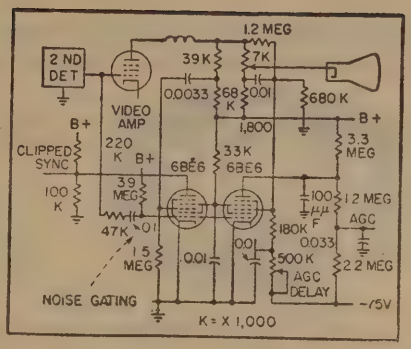


Fig. 5: Second type 6BG6 pentagrid tube is added for AGC amplifier.

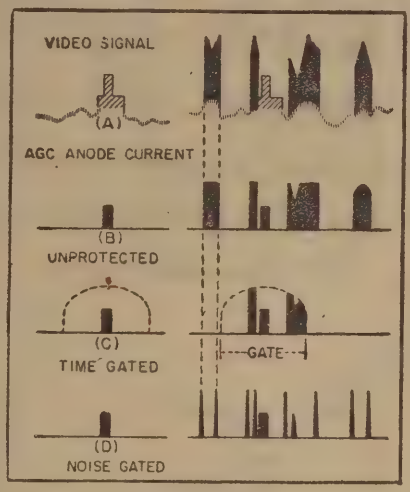


Fig. 6: Comparison of various gating systems in presence of noise.

stable condition where the picture is split; the horizontal syncs appear as a black stripe near the centre of the picture and the contrast level is too high. This occurs when, at the instant of switching, the horizontal sweep is about 180 deg. out of phase.

Since no AGC bias level has been built up, the signal gain is quite high. This causes the sinc clipper to treat the sync pulses like noise pulses and gate them out. Around the centre of the horizontal period some portion of the video may cause the clipper to conduct and produce output. The horizontal frequency control system accepts this output as sync pulses and becomes synchronised in an out-of-phase condition. This causes the time gate for the AGC to continue in the wrong phase—thus suppressing the real sync pulse.

LEVEL STABILISES

The signal level then stabilises at a point where the video portion previously mentioned is raised to the level where the sync tips should be. This finally perpetuates the condition that started it all—the gain is so high that the sync tips are treated like noise pulses.

This chain of errors cannot occur with weak signals, because even a slight AGC voltage tends to push the video level down low enough. In areas where all signals are weak the control may thus be set for maximum protection. But where stronger channels exist, it must be set to accommodate the strongest.

In Fig. 5, a second 6BE6 pentagrid tube is added for use as AGC amplifier. The time gating is removed and the anode is then connected, as in the original DC circuit, through a network to a high negative supply point, so the AGC take-off point is at zero or slightly positive potential for no signal. The first grid, screen and cathode are in parallel with the sync clipper tube. This provides the same noise gating for both circuits.

Since it is desirable to get high DC gain for the AGC, the cathode is grounded. This allows the anode to operate at a lower potential with less dividing-down in the output coupling network. The AGC control grid is biased negatively with respect to ground to be beyond cut-off for the no-signal condition. It is accomplished by returning a high resistance divider network to a high negative supply point.

SET BIAS LEVEL

A variable portion of the divider resistance is used to set the bias level and becomes an AGC delay control. This is set for the desired contrast with a fairly strong signal. The divider resistance must be high to prevent excessive loading of the negative supply that in practice is derived from the bias developed across the discharge tube grid resistor.

To prevent the loss in high response caused by coupling the video anode to the grid through a high resistance, a small capacitance connects the grid to the junction between the minimum contrast resistor and the contrast control. For best operation the ratio of AC and DC components on the AGC grid should be about unity.

In the sync clipper circuit, the fringe-lock control has been eliminated. In the absence of time gating in the AGC the conditions for split-phase hang-up no longer exist. The grid resistor can therefore be chosen for best noise protection. Also, a coupling capacitor has been added between the second detector and grid 1. This is necessary to prevent the detector from ever biasing off the AGC circuit for any extended period

ADVANTAGES

With this new circuit, an improvement in AGC performance is noticed, particularly under heavy noise conditions. Strong interference does not back off the AGC as much as it does when time gating is used; some types of noise actually deprive the AGC anode of current When this happens, the negative control voltage drops and the signal becomes stronger, an effect that is beneficial in maintaining synchronism and apparent contrast under adverse conditions. Moderate to weak noise pulses are gated out cleanly, whereas with time gating the anode would receive extra current during the entire gate periods.

Figure 6 illustrates the difference between the results of time and amplitude gating in the AGC. Line (A) shows the original signal, clean on the left and with various levels of impulse noise on

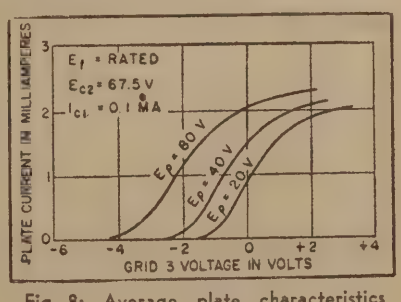


Fig. 8: Average plate characteristics for one section only.

IRC AUSTRALIA

FIT New type LB1 Continuously Compensated Variable LOUDNESS CONTROL TO YOUR RADIO OR AMPLIFIER

...and automatically keep the proper balance of all frequencies within the audio range at ANY listening level!

(Patent Applied for No. N11262)

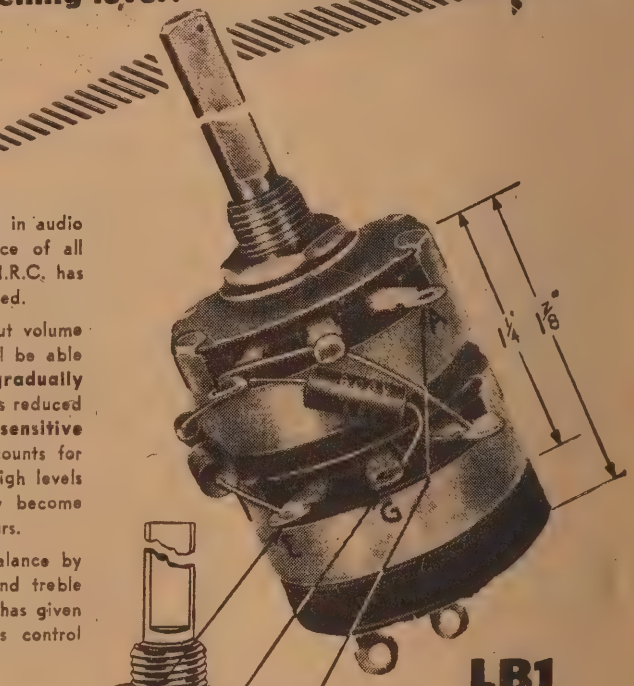
For many years there has been a need for a volume control in audio systems which would automatically keep the proper balance of all frequencies within the audio range at **any** listening level. I.R.C. has developed such a control, known as the LB1, to meet this need.

With the loudness control it is possible to reduce the output volume of any good or average audio system to a whisper and still be able to hear every tone with perfect balance, as the LB1 **provides gradually increasing high and low frequency boost** as the volume is reduced to offset the deficiencies of the human ear, **which is insensitive to high and low frequencies at low volume.** This accounts for the reason why many audio systems are operated at such high levels to give the best listening effect and in this process they become annoying to other members of the household and neighbours.

Many attempts have been made to obtain correct tonal balance by means of tapped volume controls, various types of bass and treble boost circuits and stepped type loudness controls, but none has given the performance of a truly continuously variable loudness control such as the new I.R.C. LB1.

The I.R.C. new loudness control consists of two separate volume controls operated from a single shaft of standard size and used with a combination of capacitors and resistors which are already wired. The unit will replace any volume control by transposing 3 simple connections, as indicated by the illustration at right. Can be fitted without experience.

Contact your usual supplier for illustrated literature.



LB1

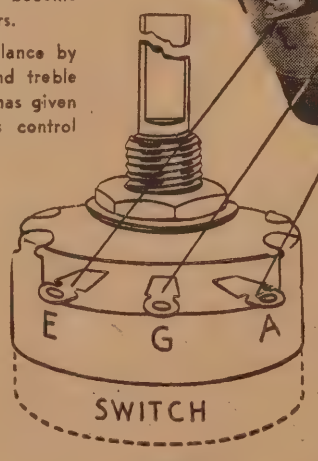
NOTE:

The automatic compensation of the LB1 eliminates the necessity for a tone control.

AVAILABLE in 1 meg. 500,000 ohms, with or without switch. Other values to special order.

PRICES

With D.P.S.T. Switch 32/6; Without Switch 26/6. Available only from your usual supplier.



PRESENT VOLUME CONTROL

Post this coupon today!

Please forward Loudness Control pamphlet giving detailed description and installation instructions.

NAME .....

ADDRESS .....

SUPPLIER (optional) ..... August

Sole Australian Agents:

Wm. J. McLellan & Co. Pty. Ltd.

126 SUSSEX STREET, SYDNEY · BX1131

(50 yards from King St.)

the right. Line (B) shows how in an unprotected AGC large currents are produced by each noise pulse. In line (C) a large percentage of the noise current pulses has been eliminated. But the largest improvement appears in line (D) where only a few transients reveal that there was any noise present in the input.

It was questionable whether pentagrid tubes were essential for this circuit. High plate impedance seemed unnecessary. Dual control tubes with only three grids such as the 6AS6, or some experimental pentodes with lower current and suitable grid characteristics, built for the specific purpose, served just as well. These considerations led to the development of the 6BU8, which combines in one structure the functions of these two dual-control pentodes.

CONSTRUCTION

Because of the common gating requirement for both circuits, the cathode, grid and screen are made one structure in the 6BU8. The third grid and anode have been split and are positioned on each side of the screen. The two halves have identical characteristics. Grid 3 and anode on one side serve the AGC and on the other side serve the sync clipper.

Alternatively, the second control grids might also be common. Both grids require a similar composite video signal. If conditions could be so that, when the sync tips extended about to the centre of the transfer characteristic of the AGC side, peak anode, current flowed on the sync clipper side, then such a circuit would work.

It would require, however, that the bias on grid 3 be lowered under extremely weak canditions; otherwise the syncs would be lost completely. This would require some carefully designed automatic bias correction, which is not easily found. An expensive alternative would be to increase the IF gain to a point where the peak video output could be maintained all the way down to the noise level.

A self-biased sync clipper, on the other hand, easily provides sync output down to the very weakest signal; thus, there is considerable advantage in keeping it divorced from the AGC.

The circuit shown in Fig. 7, using the new type 6BU8, has been used successfully in production sets.

A time-gated AGC tends to obstruct horizontal pull-in if it responds too fast. This effect does not apply here and a time constant shorter than usual can be used, making the sets unusually resistant to rapid fading and airplane flutter.

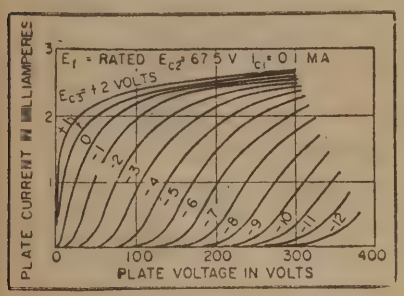


Fig 9: Average plate characteristics (one section) with plate voltage plotted as abscissa.

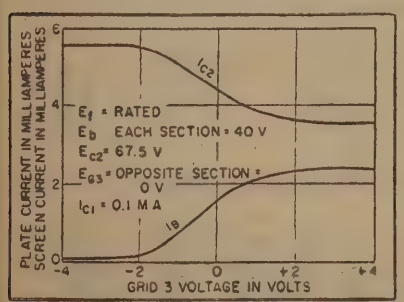


Fig 10: Average transfer characteristics for one section of 6BU8 tube.

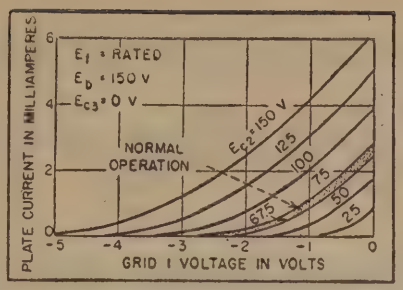


Fig. 11: Plate current plotted against grid-1 voltage shows transfer characteristics of the new tube.

CHARACTERISTICS

In the new tube two separate electron streams leaving the cathode may pass through grids number 3 to each of the plates. As grid 3 of either section is made negative, the anode current of that section is reduced and the unaccepted current returned to the screen grid and the shield. The two halves operate independently of each other except for grid 1 and screen grid.

A shield being connected to the screen grid has a threefold purpose. It prevents electrons from flowing around grids 3 to the anodes, it catches the electrons that might otherwise bombard the bulb, and it prevents occurrence of Barkhausen oscillations.

Figure 8 represents the plate characteristics for either section plotted against grid 3 voltage. The AGC section of the tube normally operates with low plate voltage, not far from 20 volts; however, the sync clipper section may work with higher voltages on the plate. Curves are shown for 20, 40 and 80 volts.

A video signal with sync pulses going toward the right increases the plate current to the maximum level, producing only the sync pulse in the output. In the AGC section the sync pulses extend to about the centre of grid 3 control characteristic

Essentially the same information is shown in Fig. 9 except plate voltage has been replotted on the abscissa.

NEGATIVE GRID

What happens to the electron streams when grid 3 is made negative to block the flow of plate current is shown in Fig. 10. Most, if not all, of this current appears on the screen and shield so that a negative transconductance exists from grid 3 to these electrodes. Since the screen is common to both sections, the effect of both grids 3 shows up simultaneously in the screen current

Figure 11 shows how the plate current in either section is controlled by the voltage on the first grid. In normal operation the screen is at about 70 volts and grid 1 is at about zero volts. A noise pulse of about —2.4 volts will cut off the tube entirely.

The RADIOMASTER

RADIOGRAM CHASSIS . . .

A great performer on Radio and Records

HI-FI MODEL E22 reproduces perfect high treble notes and bass notes without "drumming" or distortion—brings recorded sound to your home as near as possible to the original. A high gain R.F. stage ensures satisfactory long distance radio reception regardless of location Features include:—

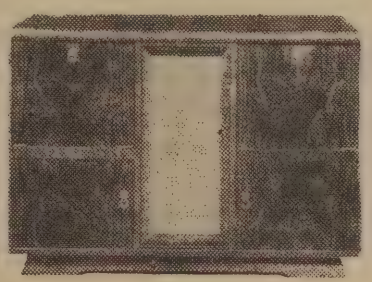
- *Treble and bass boost with separate controls.*
- *Two matched Jensen speakers (12in and 6in) with crossover network*
- *Eight valves, world range.*
- *Push-pull output—inverse feed-back.*
- *Radio-gramophone switch.*
- *Provision for tape recorder.*
- *Latest type Radiotron valves.*
- *Straight line dial in four colours, size 12½in by 7½in.*
- *Custom built — six months' guarantee.*
- *Frequency coverage: 40 to 13,500 cycles.*
- *Design tested and approved by the Valve Application Division of Amalgamated Wireless (A'sia) Ltd.*

PRICE £40/15/-

Magic Eye tuning indicator 25/- extra. Packing included. Freight extra. Other Radiomaster Radiogram chassis are available from Write for particulars £22/15/-

SPEAKER ENCLOSURES

RADIOGRAM CABINETS



Many popular designs available including contemporary in natural maple.

NEW CABINET MODELS FOR HI-FI CHASSIS incorporate vented speaker enclosures which provide for dual speakers in separate compartments, with "woofer" compartment felt lined and draped. First-class finish

ALL TYPES OF THREE-SPEED RADIOGRAM UNITS

WRITE FOR CATALOGUE

H. B. RADIO PRODUCTS

103-105 Catherine Street, Leichhardt, SYDNEY.

Telephone LM5580

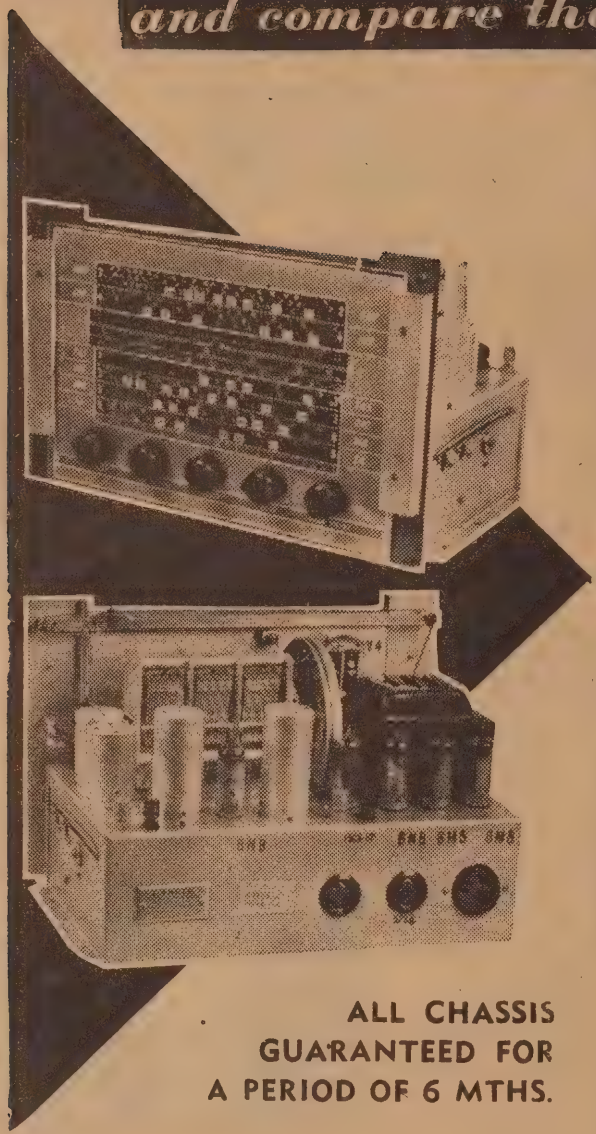
Established 25 Years.

before purchasing your radio see our—

Hi-Fidelity

RANGE

and compare these NEW features..



NEW:

Ultra modern circuit using nine high gain valves including "magic eye" tuning indicator. Permatuned iron cored coils and intermediates giving excellent interstate recepotion and a short wave range of 12,000 miles. All valves used are the new Mullard nine pin innoval series.

NEW:

Tone control and audio stages incorporating the Mullard 5/10 amplifier circuit with separate bass and treble controls giving + or — 15db. boost or cut at 50 cycles L.F. and 10,000 cycles H.F., combined with push-pull output with inverse feed-back gives you really high fidelity reproduction from your radio or favourite recordings.

NEW:

Dual Speaker combination using a nea y duty woofer (12in M.S.P. Jensen AU54 special) with matching 6in tweeter and cross over network giving a frequency response of 46 to 13,000 cycles. Sp kers are mounted coaxially making only one 11in mounting hole necessary.
If required the new Magnavox high fidelity twin coned speaker can be supplied.

NEW:

Large calibrated edge-lit dial in plate glass (11in x 4in) with main stations of each State in prominent type. Dial fitted with counter-weight drive giving smooth tuning. Indicator lights are fitted showing which band is in operation. Dial can be supplied in cream, black or brown with matching knobs and escutcheon to suit contemporary blond or walnut finished cabinets.

NEW:

Sensitive "magic eye" tuning indicator (EM80) making tuning simple and positive even on interstate overseas and country stations.
All chassis are wired for the fitting of an F.M. tuner or tape recorder, special plug being provided on back of chassis, also pick-up terminals and outlet for gramo motor.
Power switch is fitted to volume control, radiogram switch combined with wave change switch. Audio end of set can be used with TV receiver if required.

ALL CHASSIS GUARANTEED FOR A PERIOD OF 6 MTHS.

A NINE VALVE HIGH-FIDELITY RADIOGRAM CHASSIS

Nine and ten valve chassis incorporate the Mullard 5-10 AMPLIFIER CIRCUIT Frequency response 40-13,000 cycles. Max output 10 watts.

£41/15/0 F.O.R

A NEW 10 VALVE DUAL WAVE RADIOGRAM CHASSIS

WITH BASS AND TREBLE BOOST

The ideal chassis for those difficult locations where reception is doubtful. Specifications as nine valve unit, but with the addition of high gain tuned R.F. stage giving greater sensitivity and selectivity on both broadcast and short wave bands.

£44/15/0 F.O.R

RECORD PLAYERS AND CHANGERS

We have a complete range of 3-speed record playing equipment, including Dual, Collaro or Garrard Players, with turnover crystal pick-ups or your choice of Garrard, Stromberg-Carlson, Collaro or the new Dual 3-speed changer that will play 7, 10 or 12in records intermixed. All changers have turn-over Crystal pick-ups.

Write for full specifications

Classic Radio

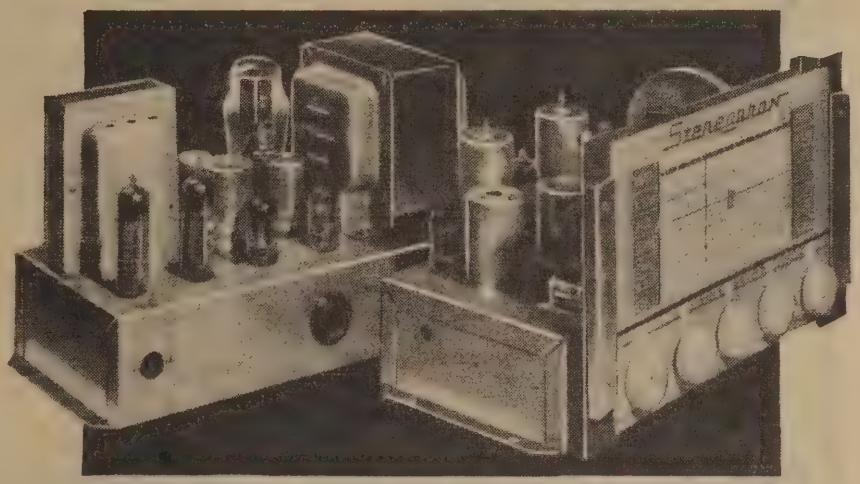
245 PARRAMATTA ROAD, HABERFIELD N.S.W PHONE UA2145

NEW *Releases!*

CLASSIC RADIO TAKE PRIDE IN ANNOUNCING TWO NEW ADDITIONS TO THE ALREADY FAMOUS LINE OF HI-FIDELITY RADIOGRAM CHASSIS.

Stereophan LIVING SOUND

A compact 11-Valve High-grade Radiogram in two chassis, featuring a variable bandwidth Tuner, multi-input preamplifier and Tone Control in one unit, and a 10 Watt Ultra-linear Amplifier. Ideally suited for use with High-grade Pick-ups and Speakers.



SUMMARY OF PERFORMANCE

TUNER:

Broadcast Band, 2 position Bandwidth, whistle filter, EM80 Tuning Indicator, attractive Dial

PRE-AMPLIFIER:

Microphone input sensitivity 1.5 mV
Pick-up input 1. High sensitivity 5mV
2. Low sensitivity 50mV
Tape or T.V input sensitivity 100mV
All inputs controlled by one 6-position functional switch. Power switch on Volume Control

TONE CONTROL:

Separate Bass and Treble Controls giving 20db boost to 18db cut for both controls.
R.I.A.A. Equalisation for L.P and E.M.I Equalisation for 78 records

AMPLIFIER:

10 Watt Ultra-linear with Ferguson O.P 301 Output transformer 6BQ5 output valves
Frequency response 30-20,000 cycles + or – 0.5db
Harmonic distortion better than 0.1 per cent.
Output impedance 15 ohms or as required.

QUALITY never before at this PRICE **65 GNS.**

NEW SEVEN-VALVE HI-FI CHASSIS

THIS NEW COMPACT DUAL WAVE SEVEN VALVE CHASSIS USES THE SAME TUNER CIRCUIT AS OUR 9 VALVE UNIT. WITH THE MULLARD TONE-CONTROL CIRCUIT GIVING SEPARATE BASS AND TREBLE CONTROLS PUSH-PULL OUTPUT USING TWO OF THE NEW 6BM8 DUAL PURPOSE OUTPUT VALVES AND HEAVY DUTY M.S.P SPEAKER **£31/15/-** F.O.R. PACKING 10/- EXTRA.

ALSO AVAILABLE WITH MAGNAVOX 12W.R HI-FI SPEAKER AND FERGUSON OUTPUT TRANSFORMER AT £4/15/- EXTRA.

Classic Radio

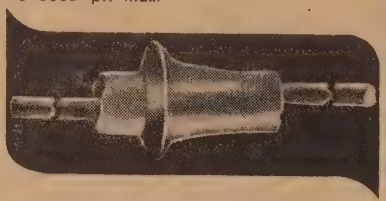
245 PARRAMATTA ROAD, HABERFIELD, N.S.W. PHONE UA2145

MINIATURISED

DUCON

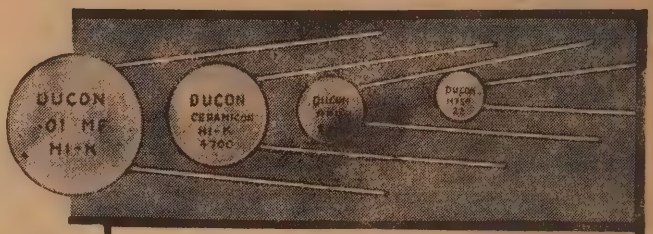
RADIO & TV Components

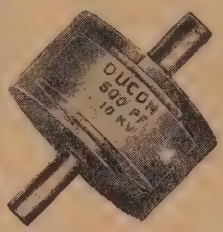
TYPE CAE—Screw mounting stand-off variety in capacity ranges of 100 pf. min. to 3000 pf. max.



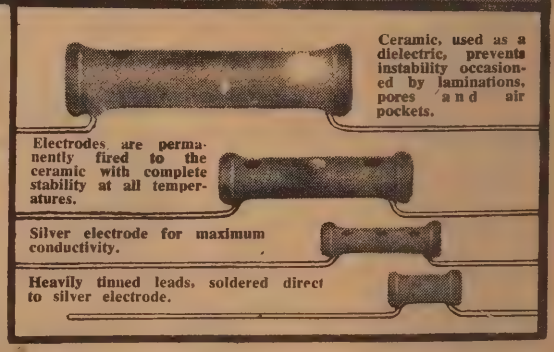
TYPE CAC 100—Feed-thru flange mounting type® can be soldered direct to the chassis or shield plate in tuner units From 50 pf. min. to 1500 pf. max.

The disc ceramicon, with its short RF current path when soldered direct to the tube terminals, reduces the inductance to very small val ues





Type TV high voltage disc capacitors encased in "DURITE" for T.V., and other high voltage applications

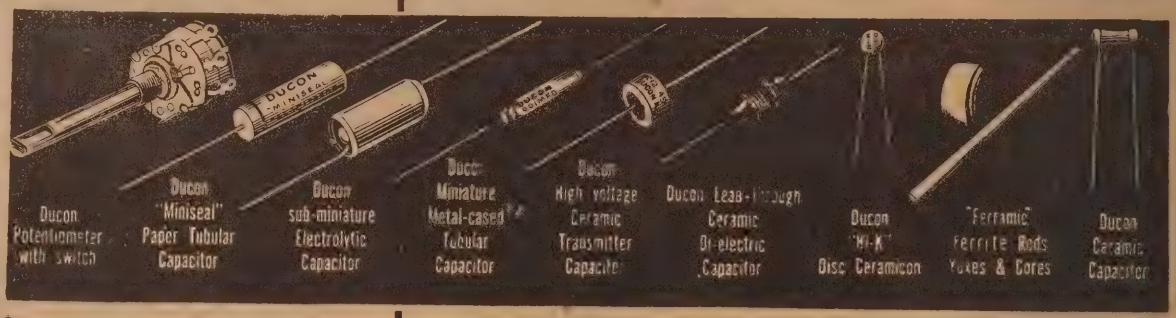


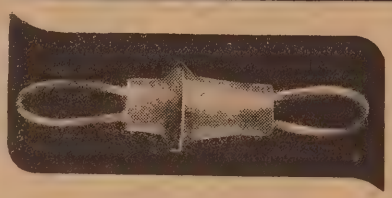
Ceramic, used as a dielectric, prevents instability occasioned by laminations, pores and air pockets.

Electrodes are permanently fired to the ceramic with complete stability at all temperatures.

Silver electrode for maximum conductivity.

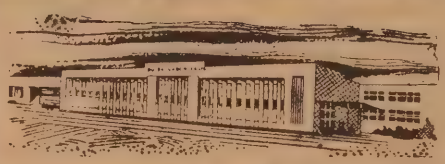
Heavily tinned leads, soldered direct to silver electrode.


Ducon Potentiometer with Switch
Ducon "Miniseal" Paper Tubular Capacitor
Ducon sub-miniature Electrolytic Capacitor
Ducon Miniature Metal-cased Tubular Capacitor
Ducon High voltage Ceramic Transmitter Capacitor
Ducon Lead-through Ceramic Bi-electric Capacitor
Ducon "Hi-K" Disc Ceramicon
"Ferramic" Ferrite Rods Yokes & Cores
Ducon Ceramic Capacitor



TYPE CAC—Feed-thru flange mounting type can be soldered direct to the chassis or shield plate in tuner units. From 50 pf. min. to 1500 pf. max.

TYPE CAE 100—Stand-off flange mounting style mounted by soldering to the chassis. From 50 pf. min. to 1500 pf max.



New modern Leightonfield Works provide further expansion for Ducon manufacture and expedience of delivery.

DUCON

DUCON CONDENSER LIMITED

Christina Rd and Birmingham Ave., Villawood, N.S.W UB0133.

SUBSIDIARY COMPANIES:
Simplex Products Pty. Limited.
Mica Products Pty. Limited.
Ducon General Ceramics Pty. Limited.
Ducon (N.Z.) Limited, 21 Grey St., Wellington, 42-411

VICTORIAN OFFICE:
Ducon Condenser Lmited, 241 William St., Melbourne MY1977

INTERSTATE AGENTS:
Wm. T. Matthew Ltd., 95 Grenfell St., Adelaide W3361
P. H. Phillips Pty. Ltd., 458 Brunswick St., Brisbane. LW2011.

ASSOCIATE COMPANY: P. R. Mallory & Pty. Limited

NEWS AND VIEWS OF THE MONTH

Rockets study the sun

THE U.S. Navy said it would launch the International Geophysical Year rocket program on July 1 with a series of firings to study eruptions on the sun.

Fourteen firings are scheduled from San Nicolas Island, offshore from the Navy's air missile test centre, and each will be dependent upon appropriate weather.

The geophysical year is an 18-month period during which scientists of 62 nations will conduct experiments and studies to learn more about the earth and the universe.

The Southern California rocket firings, to continue for two or three months, will study the tremendous eruptions near sunspots. These so-called flares interfere with radio broadcasts.

The rockets, combinations of a Deacon rocket and a Nike booster, are designed to carry ultra-violet and X-ray detectors 80 miles high and transmit telemetered data back to earth for a three-minute period.

Flat TV screens

FLAT television screens, which hang on a wall like a picture, were demonstrated recently in New York.

The makers displayed a series of flat glass panels, each one-eighth of an inch thick, on which images were reproduced by electrical and optical signals.

Company spokesmen say the big advantage of flat TV is that it takes up much less space than a receiver using conventional cathode ray tubes.

They showed a small central receiver about the size of a table radio, which can be placed anywhere in a house.

Wires connect it to thin panels.

Flat wall TV, however, is not coming on the market in the near future.

Executives explained that the present glass panels are laboratory devices and much developmental work must still be done.

"But flat wall TV is possible in four or five years and a few million dollars from now," one said.

Aborigines and cold

A CANADIAN biologist will spend the next two months in remote Central Australia trying to learn whether Australian aborigines can make it easier for Canadians to live and work in the frigid Canadian north.

Dr. J. S. Hart, 41, head of the animal physiology section of the Division of Applied Biology of the National Research Council, will make the study as a member of an international anthropological expedition.

The team also includes biologists from the U.S., Sweden and Norway.

They will live with the aborigines for two months trying to learn how natives can live naked throughout the year, even in below-freezing weather.

An official said the aborigines' ability to sleep naked on the ground in below-zero weather was "amazing."

Atomic gas mask

SCIENTISTS have developed an Atomic Age facemask to protect soldiers against inhaling radio-active fall-

POPULAR SCIENCE QUIZ

Q: We have heard a great deal about the need to conserve water. With the vast oceans of the world available, why can't fresh water be made from salt?

A.: Fresh water can be made from salt and, in fact, this is often done by various means. The difficulty is that the amount of energy required is too great to be practical in many cases.

By common definition, fresh water is defined as having less than 1,000 parts per million of dissolved salts, although for drinking, it is desirable that only half this amount of dissolved salt be present.

The salinity of ocean water varies according to the part of the world, but averages about 35,000 parts per million. In the Baltic Sea it is only about 7,000 parts per million, while in the Persian Gulf it is nearly 40,000 parts per million.

Q: What are the dissolved salts?

A.: The substance we normally refer to as salt, common salt or sodium chloride, accounts for most of the saltiness of sea water, but there are some 44 dissolved elements in all. Strange as it may appear, gold appears in sea water at the concentration of about 0.00,006 parts per million.

Taking the total concentration as 35 parts per million, the principal substances dissolved are as follows:

Sodium Chloride (NaCl)—27,213.
Magnesium Chloride (MgCl2)—3,807.
Magnesium Sulphate (MgSO4)—1,658.
Calcium Sulphate (CaSO4)—1,260.
Calcium Carbonate (CaCO3)—123
Magnesium Bromide (MgBr2)—76.

where the concentrations are expressed as parts per million.

Q: How can these dissolved salts be removed?

A.: The obvious way is to evaporate the water in a still. Heat is applied, pure water evaporates and then can be condensed by cooling, leaving the salts. For a simple still it requires about 2,800 kilowatt hours of energy (in the form of heat) for each 1,000 gallons of water. This is a large amount of energy.

Some of the more efficient processes now being developed, it is hoped, will enable this to be reduced to about 10 or 15 kilowatt hours per 1,000 gallons when making fresh water from sea water may become a practical proposition.

Q: What are some of the more efficient methods of making fresh water from sea water?

A.: An idea first patented by a Frenchman, Pierre Pelletan, in 1840, enables the energy required for 1,000 gallons of water to be reduced from 2,800 kilowatt hours per 1,000 gallons to about 200 kilowatt hours per 1,000 gallons of water.

It is called "compression distillation," and involves carrying out the distillation at a pressure above atmospheric pressure when a higher temperature will be required to make the water evaporate. A following stage at lower pressure can be used when the water will evaporate at a lower temperature, enabling some of the heat from the previous stage to be used. A practical installation may use a number of these stages in series so that a large part of the heat supplied can be put to use.

The idea of using the "free" energy from the sun has received investigation, and a number of practical systems to make use of this source has been devised.

Yet another method involves the use of pressure and a special membrane which is permeable to water but not to salt. The salty water is placed in a container fitted with this membrane, and a pressure greater than the osmotic pressure between sea water and fresh water applied. This is approximately 350lb per square inch.

It has been demonstrated that with membranes made of cellulose acetate, 90 to 95 p.c. of the salt can be removed from the water in one pass.

Other interesting processes, still in the developmental stage, involve separation of the salts from water by freezing. Also, work has been done along the lines of dissolving salt water in organic solvents which do not dissolve salts.

The ion-exchange process uses resins or other material where the ions are unobjectionable, to replace the salt ions, and therefore is useful for softening water for many industrial processes.

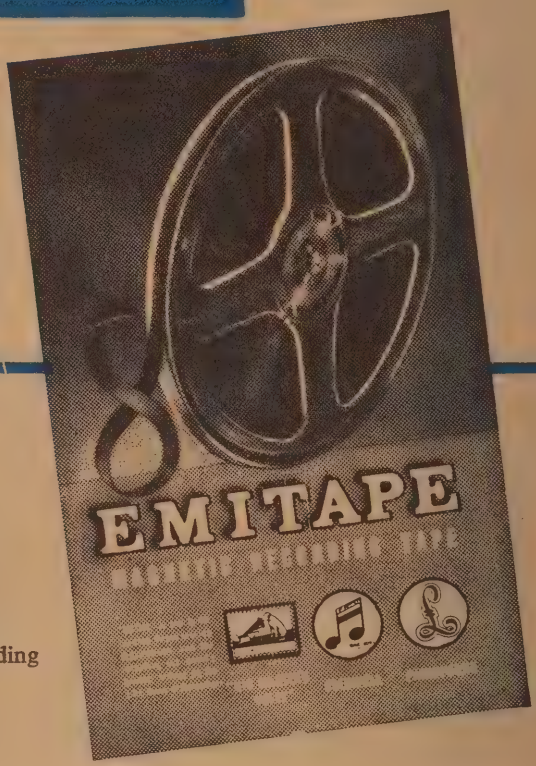
The production of pure water from sea water in large quantities at low cost is an extremely important matter in many parts of the world, and extensive research will certainly be continued until a satisfactory method is found.

This is the WORLD'S FINEST MAGNETIC RECORDING TAPE

EMITAPE

As used by the leading Broadcasting Organisations and for the recordings by:

"HIS MASTER'S VOICE,"
COLUMBIA AND
PARLOPHONE



EMITAPE "88"
General-purpose tape available on spool sizes from 3" to 7" diameter.

EMITAPE "99"
Long play—thin-based tape, giving 50% increased recording time on same spool range.

EMITAPE uses P.V.C. (polyvinyl-chloride) high-tensile film base — the film base which has strength plus stability under varying temperature and humidity conditions.

EMITAPE has a specially developed magnetic oxide coating of high sensitivity with an electrical specification designed to achieve the maximum performance from all tape recorders, all speeds, single or twin track.

Engineering Sales Division,
E.M.I. (AUSTRALIA) PTY. LIMITED, 301 Castlereagh Street, Sydney, N.S.W.
E.M.I. (AUSTRALIA) PTY. LIMITED, 167 Flinders Lane, Melbourne, Victoria.
E.M.I. (AUSTRALIA) PTY. LIMITED, 265 Rundle Street, Adelaide, S.A.
A. E. HARROLD PTY. LTD., 123 Charlotte Street, Brisbane, Qld.
MAINLINE DISTRIBUTORS PTY. LTD., 73 King Street, Perth, W.A.

TR.15.FP

out particles.

The lightweight mask, now undergoing final tests, is designed to give complete protection against war gases, germ welfare and fall-out particles.

But it will not protect the wearer against direct radiation.

The mask was developed by the Army Chemical Corps and a mine safety appliance company in Pittsburgh.

Instead of having the standard protruding canister used in World War II gasmasks, the new device has pliable gas-aerosol filters moulded into the rubber facepiece.

The mask provides easier breathing, better vision, improved speech transmission, and greater comfort.

Safer cigarettes

FRENCH scientists claim to have developed cigarettes free of the agents which are believed to cause lung cancer.

They treat the tobacco and cigarette paper with chemicals to neutralise these agents.

Dr. Raymond Labarjet, a cancer expert, and a team of scientists from a State-owned tobacco firm believe France will have the first "cancer-free" cigarette on the market.

Using robot smokers, the scientists found that cigarette paper was more liable to lead to cancer than tobacco.

They found they could cancel out dangerous tars by treating the paper with ammonium sulphide and the tobacco with nitrogen compounds. — U.P.

Homework and TV

FRENCH schoolchildren who watch television do better homework, according to the results of an inquiry.

Children know exactly what they wish to see on television.

Of 200 boys and girls over 14 questioned, the Association of Research Studies said 49 per cent stated they liked interviews, newsreels and documentary shorts.

Seventeen per cent liked films, 16 per cent variety shows, 9 per cent sports, 5 per cent plays, 3 per cent circus, and 1 per cent concert music.

Schoolteachers were in favour of television.

They noted that homework was better done by children who watched TV than others who did not.

Mont Blanc power

THE famous glacier on Mont Blanc known to tourists as the Mer de Glace, is soon to be harnessed to provide hydro-electric power for France.

The scenic beauties of the region, however, will remain unspoiled, since all constructions are to be underground.

According to recently announced plans, the river flowing beneath the glacier will be tapped at an altitude of 4,700 feet.

The water will be drawn off through a tunnel over a mile long to a point where high pressure pipes will carry it down a sharp drop of some 1,200 feet to an underground power station in the valley of Chamonix.

A similar scheme has been worked out for the glacier of Argentiere, on the other side of Mont Blanc.

Electric power produced through this scheme is expected eventually to reach hundreds of millions of kilowatts a year.

A.W.A.

CRYSTAL-CALIBRATED MARKER GENERATOR

A56057

This T.V. calibrator provides reference signals of crystal accuracy as an aid to a wide range of radio servicing, design or developmental work.

GENERAL FEATURES

- R.F. coverage 19-260 Mc/s fundamental frequencies in two continuously tunable ranges.
- The tuning dial of spiral shape has effective length of 72 inches.
- 2.5 Mc crystal provides check points over full frequency range.
- Crystal mixer and audio circuit enables unit to be used as hetrodyne frequency meter.

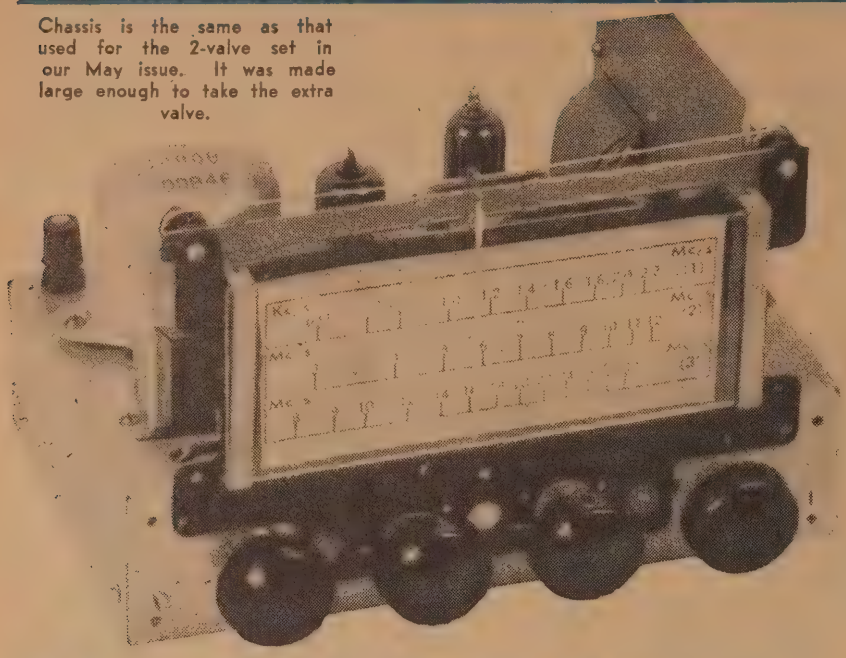
when used for TV work

- **5.5. Mc crystal aids i.f. alignment.**
- **Special modulation enables production of horizontal and vertical bars on T.V. screen.**
- **Equipment may be modulated with video or r.f. signals.**

For further particulars contact

AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

47 York Street, Sydney. B0233. 167 Queen Street, Melbourne. MU9161. 544 Murray Street, Perth. BA5945. 138 Wakefield Street, Wellington, N.Z. 43-191.



Chassis is the same as that used for the 2-valve set in our May issue. It was made large enough to take the extra valve.

A special calibrated card is available for the dial—see block on page 37.

The 1957 3-Band Three Valve Receiver

In our May issue we described a small set using the two-in-one 6U8 valve. Small and simple as this set was, it gave excellent results even on loudspeaker. In this our latest version, the addition of an audio stage will ensure adequate room volume and extend its usefulness on all three bands.

by Wes Yashin

SMALL sets have always had a place in the scheme of things, a fact made abundantly clear by the popularity of the variety we have described in the past. A large number of circuit designs have been evolved, most of them aiming at economy and simplicity, and the simple receiver for three bands, described in the May issue, was no exception.

Economy was achieved by the use of a two-in-one valve, although some circuit simplicity was sacrificed by the use of band switching. However, the ease of manipulation was considered to be of prime importance, since the set was intended for rack or cabinet mounting.

GOOD PERFORMER

Given a reasonable length of aerial, this set was capable of bringing in the more powerful overseas stations, while, with a few feet of wire on the floor, sufficient power was available to operate a speaker on the local stations.

While quite adequate in many cases, we felt that the addition of an extra audio stage would be a worthwhile improvement. A number of letters in the mail expressing a similar feeling resulted in the present version of this set.

It will be noted that the circuits are almost identical, the main differences being in the additional audio stage and the filtering and decoupling circuits. The triode section of the 6U8 has been altered to a voltage amplifier with the appropriate alterations to the bias resistor and the plate load.

For those not familiar with the principles of reaction, a few words may not be out of place. Briefly, it consists of feeding back some amplified R.F. signal into the input. The amount of energy fed back is carefully adjusted and may make up for the deficiencies of a tuned circuit, improving the selectivity and increasing the amplification.

Too much feedback will cause oscillation and the detector will produce a radio frequency of its own which, when it beats with an incoming carrier signal, will produce the characteristic squeal or howl of the regenerative detector.

This tendency for the detector to oscillate with excessive feedback may not always be undesirable, for, if allowed to oscillate weakly, it will allow the reception of Morse code stations. The beat note produced obviates the need for a beat oscillator as is normally fitted in the more elaborate receivers.

A type 6U8 valve is used as the detector and first audio. A pentode and a triode are combined in the one envelope, both sections having good performance figures even when compared with single valves of the same type.

The pentode section is connected as a leaky grid detector, while the triode section is a voltage amplifier to provide the gain and the drive for the output stage.

REGENERATION

Feedback for the regenerative circuit is obtained by placing a tap in the grid winding and returning the cathode to this point. This method has the advantage that a single tapped coil is required and regeneration may be controlled by varying the voltage on the screen of the pentode.

Since the gain of the pentode section as an audio amplifier is intimately connected with the screen voltage, and the screen voltage governs the point at which the valve will go into oscillation, the placement of the tap on the grid winding is important in deciding the screen voltage which will bring about this condition.

It should be possible to select a position for the tap on the grid winding, at which the screen voltage and consequently the audio gain is as high as possible without exceeding the peak gain value and the consequent sudden drop in gain.

The triode section is connected as a voltage amplifier, differing from the earlier circuit in the values of bias resistor and plate load. A volume control in the grid circuit allows the optimum position of the reaction control to be used at all times, thus retaining maximum selectivity.

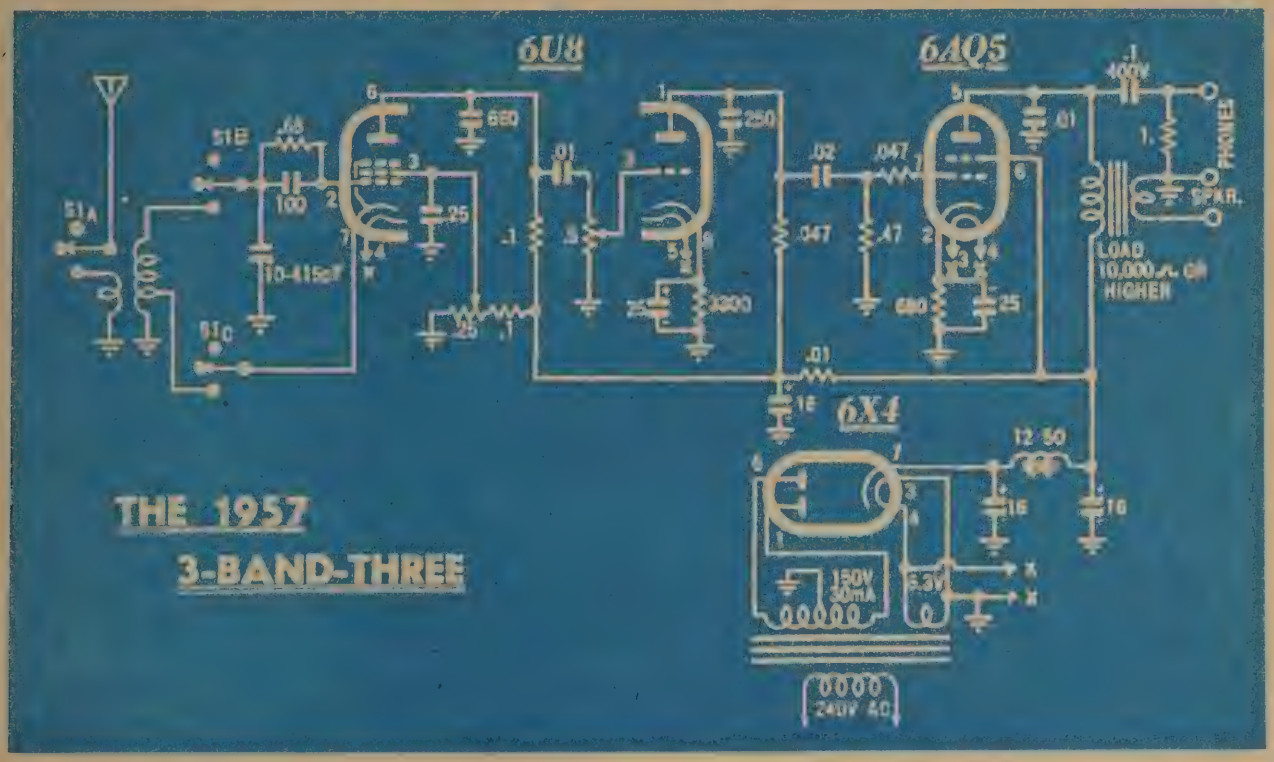
Due to the high audio gain of the set it was desirable to introduce decoupling to the first two stages. With the values specified, there should not be the slightest trace of hum even on headphones with the gain full on and no signal.

OUTPUT STAGE

The final stage is a conventional power output stage and needs little elaborating. The maximum power output is just over half a watt, giving useful room volume from a loudspeaker. For greater effective amplification, the alternate use of headphones is provided for. In this position the headphones are connected between the output plate and ground through a capacitor.

Readers who have low impedance

CIRCUIT DIAGRAM OF THE NEW 3-BAND RECEIVER



The circuit is quite simple, but the extra stage gives good speaker results.

headphones may connect them across the voice coil winding of the output transformer. The load presented to the valve will not be optimum but will give good gain, which is all that matters.

The resistor connected across the phone terminals is to prevent the coupling capacitor discharging and thus placing the terminal at the potential of the output plate. The resistor ensures that the capacitor is charged and that the D.C. potential of the terminal is at chassis level. The power supply needs little comment, being quite standard.

A frequent query with sets of this type concerns the use of a power transformer with secondary voltages higher than specified. This is in order provided the final high tension is kept around the figure recommended for the particular design.

DROPPING RESISTOR

The obvious way in which to get rid of excess volts is to introduce a dropping resistor in the high tension line. A good place for this is between the rectifier and the first filter capacitor. A resistor in this position will limit the peak output from the rectifier, making it easier for the rectifier and the first filter capacitor.

Calculating the dropping resistor requires a working knowledge of Ohm's Law, which all radio enthusiasts should possess. The value of dropping resistor, when used directly after the cathode of the rectifier, is somewhat lower, but the optimum value may be arrived at by trial and error.

The chassis used was the same as specified for the original set and no difficulty should be encountered in the fitting of the extra components since adequate space is available. The USL/37 dial was retained, and art paper calibrations will still be available through the query service. Those who have constructed the original set need no alterations to the front end.

For those who are starting from scratch, it will be necessary to take the dial to pieces and re-assemble it to fit the requirements of the set. The control spindle should be moved from left to right and mounted on the chassis, using a countersunk bolt in the inside hole of the spindle bracket to clear the dial plate.

The dial mechanism is held by two 1-8in bolts and the retaining nuts of the switch and potentiometer spindles.

The under-chassis photograph clearly demonstrates the wiring layout with the additional components. Point-to-point wiring was used, and most of the components suspended by their pigtails.

The 6U8 is mounted with a gap in the pins facing the upper left side corner of the chassis. A three- and a two-lug mounting strip are mounted under socket retaining bolts to the left and the right of the socket respectively. The three-lug strip is an anchor point for the plate loads of both the triode and pentode sections of the 6U8 and the .01 decoupling resistor and its bypass electrolytic.

The output valve grid leak is anchored between the lugs of the two-lug strip.

PARTS LIST

1 Chassis 8x5x1¾ inches.
1 Panel, 9x5⅝ inches.
1 USL/37 dial.
1 Roblan single gang. (10-415 pf)
1 3x3 single deck switch.
1 150/30 power transformer.
1 12/50 choke.
1 Speaker transformer (10,000 ohms or higher).
1 Noval socket.
2 Miniature 7-pin sockets.

VALVES

1 6U8, 1 6AQ5, 16X4.

CAPACITORS

3 16 mfd 350 volt electrolytics.
2 25 mfd 40 volt electrolytics.
1 .25 mfd 400 volt paper.
1 .1mfd 400 volt paper.
1 .02 mfd 400 volt paper.
2 .01 mfd 400 volt paper.
1 680 pf ceramic.
1 250 pf mica or ceramic.
1 100 pf mica or ceramic.

RESISTORS

1 .68 meg ½ watt.
1 .47 meg ½ watt.
2 .1 meg ½ watt.
2 .047 meg ½ watt.
1 .01 meg ½ watt.
1 3300 ohm ½ watt.
1 680 ohm 1 watt.
1 .25 meg pot.
1 .5 meg pot

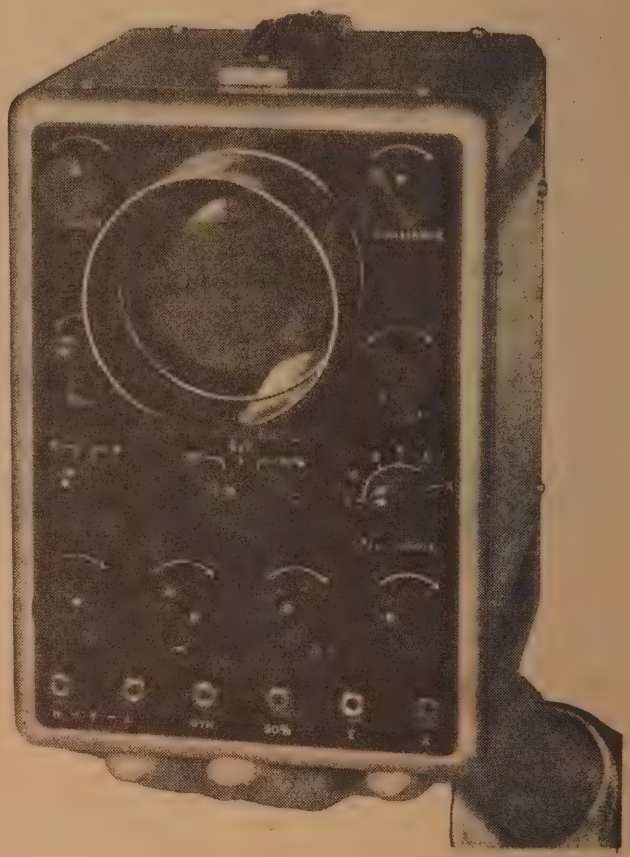
SUNDRIES

4 knobs, 5 terminals, 1 4-lug strip, 2 3-lug strips, 1 2-lug strip, materials for coils, hookup wire, solder, flex, power plug, nuts & bolts.

NOW! EX STOCK! £65-0-0

ELECTRONICS

MODEL TV-1 OSCILLOSCOPE



Designed and built in Australia by Electronic Industries Limited for Australian conditions.

A compact, direct coupled oscilloscope for television servicing and installation.

Latest 2¾" Cathode ray tube . . . technically sound . . . lightweight, portable unit. Push-pull vertical and horizontal amplifiers.

Specifications –

Vertical Amplifier: 2 position switch for choice of gain/bandwidth conditions. Push-pull amplifier gives a symmetrical undistorted picture.

"N" position . . .

sensitivity 50 mV/Cm. D.C. to 100 Kc/S. (—3db).

"W" position . . .

sensitivity 500 mV/Cm. 20 c/s to 3Mc/S. (—6db).

Deflection is not limited in the "N" position and the undistorted amplitude may be expanded to more than fill the screen. In the "W" position, the undistorted amplitude is limited to a height of 2 Cm (¾") which is quite adequate for the examination of television pulses.

In addition to a gain control, alternative input sockets are provided, the "H" position utilising the total amplifier gain, with a D.C. input resistance of 0.5 megohms.

The "L" (low) gain position provides an attenuation of 20 times with a D.C. input resistance of 10 megohms and is frequency compensated.

Horizontal Amplifier: D.C. to 100 Kc/S. (—3db) with a maximum sensitivity of 70 mV/Cm and an input impedance of 1 megohm. A continuously variable gain control is fitted.

Time Base: In five ranges with continuously variable control provides sweep of from 5 c/s to 50 Kc/S. The time base is fed through the horizontal amplifier, so giving symmetrical deflection from zero to 5 screen diameters. Fly back is suppressed.

Synchronisation: Manual amplitude control.

Miscellaneous: All deflection plates and grid of C.R.T. are available for direct connection at the rear of the instrument. Direct coupled shift controls give instant spot shift.

Power Supply: The instrument is mains operated from 200–250 V. a.c. 50 c/s.

Power Consumption: Approximately 30 watts.

Dimensions: 6½" x 9" x 8".

Weight: 6½ lb. approximately.

Current Price: £65 0s. 0d., plus Sales Tax.

Ring, write or call

ELECTRONIC INDUSTRIES IMPORTS PTY. LTD.

139–143 Bouverie Street, CARLTON - - - - - FJ 4161

SYDNEY	ADELAIDE	BRISBANE	PERTH
713 Parramatta Rd., Leichhardt, N.S.W. Phone: LM 6327	90 Grote St., Adelaide, S.A. Phone: LA 4468–9	52 Bowen St., Brisbane, Qld. Phone: B 7161	68 Railway Pde., West Perth, W.A. Phone: BA 9686, BA 8587

3682

One end of the coupling capacitor and grid stopper attach to the hot end of this resistor.

A further tag strip near the hole for the power lead supports the power leads at their junction to the transformer primary leads. A four-lug strip at the rear of the rectifier socket supports most of the power supply wiring, including the filter components.

The order of wiring may be arranged to suit individual tastes, but we have found that a methodical approach leaves little chance for errors and omissions. Commence with the wiring involving leads such as the heater wiring, the transformer and H.T. leads, and so on. The bulky power supply components may be wired in next, followed by the remaining components working either from output to input or vice versa. Do not omit to earth the centre spigot of the valve sockets, since this acts as a shield between pins.

Wiring of the switch may prove tricky for some readers. However, taking it one section at a time, it should not be too difficult. Each section has three positions and each section is used for the same circuit with regards to the windings on the three coils. For example, the moving arm of the grid section connects to the junction of grid leak and tuning capacitor, selecting the hot ends of the grid windings on the three coils.

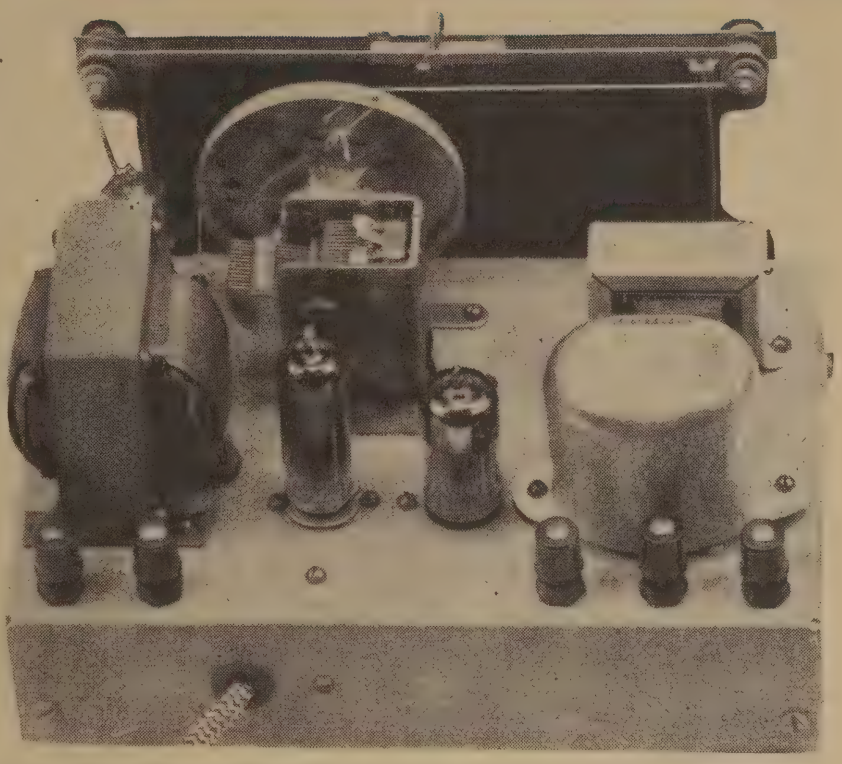
Likewise the moving arm connected to the cathode of the pentode section selects the taps on each of the three coils and the moving arm connected to the aerial selects the aerial winding of each coil.

Occasional twiddling of the switch in the right order of rotation, while wiring, should assist in distinguishing the various positions.

For those possessing a multimeter and wishing to check the performance of the set, here are some voltage and current figures as measured with an ordinary 1,000 o.p.v. meter. The total current drain should be in the vicinity of 25 mills, varying from about 22 mills with no signal to about 24 with maximum signal.

The input to filter will be 170 volts while at the output of the filter there should be about 160 volts, being the required H.T. The reading from plate to cathode of the output valve should be about 145 volts, while from screen to cathode there should be 150 volts. Cathode current, i.e., the combined plate and screen currents, for the output valve should be about 20 mills, while the bias is 11 volts.

REAR VIEW SHOWS COMPONENTS



Power transformer is at the left, speaker transformer at the right

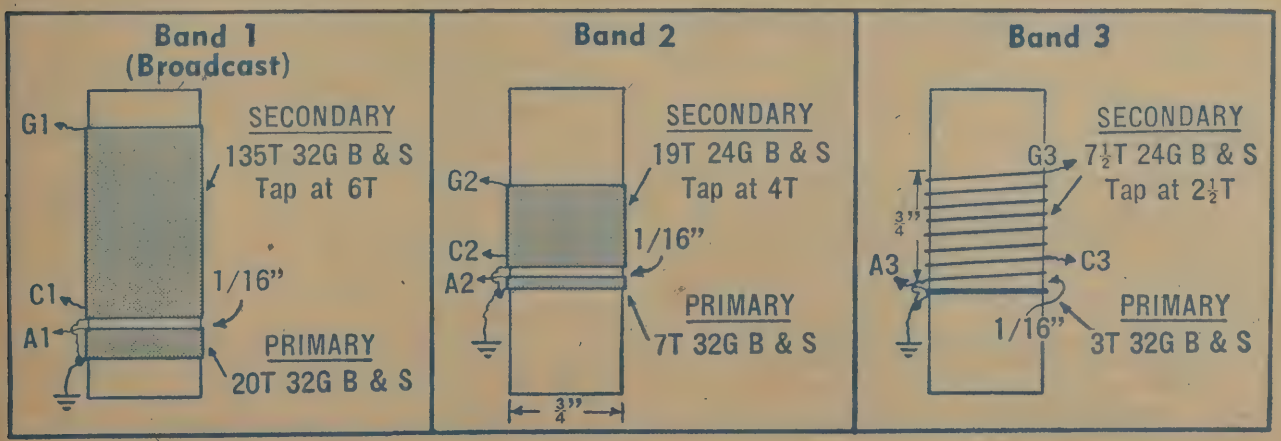
We have not mentioned the coil-winding details, since these would in most cases be tackled last. Bakelised paper formers, about ¾in in diameter, are required. Each former will have to be exactly 1¾in long, particularly for the broadcast band, in which case there is just sufficient room to wind the coil, allowing for the depth in chassis.

To hold the shortwave formers to the chassis we made two diagonally opposite cuts in the former, through which we passed strips of aluminium. These strips may be drilled and tapped or just drilled to take the retaining bolts which anchor them to the chassis.

In the case of the broadcast coil, a good deal of juggling will be required to succeed with the above method of mounting. We have found that the simplest method is to cement a shallow wooden or polystyrene plug to the lower end of the former. A bolt through the centre of the plug will anchor the former to the chassis.

Once the coils have been wired in, you will probably be very anxious to switch the set on. Leaving the rectifier out, plug the remaining valves and switch the power on. The cathodes should now glow a dull red, but there should not be any signs of heating elsewhere.

Switch the set off, plug the rectifier in, and switch the power on once again, keeping your hand on the switch—just in case. If all is well, some signs of life should be noted on turning the volume



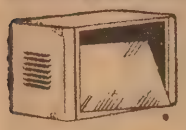
These drawings will help you to make up the coils.

COLLINS RADIO

Mail Order Service Fastest and Cheapest in the Commonwealth

NOW AT 179 FLINDERS LANE, MELBOURNE, C1. MF2582 ★

INSTRUMENT and AMPLIFIER CASES



Receiver type, vented, takes 8in x 5in chassis, with removable front panel as illustrated. Inside height, 6in. Steel black crackle finished. Front rounded corners.
Part No. 4C12, 31/6. Plus Post 4/-.
For any other type or size, use our FAST QUOTE SERVICE

SQUARE STEEL CASES. Square Corners, No Louvres.

9in x 7in x 5½ deep. Part No. 4D2 ... 20/6
7in x 5in x 4½in deep. Part No. 4D3 ... 19/6
5in x 5in x 4in deep Part No. 4D4 ... 17/6
Postage 4/- extra.

403 HOUSE NUMBERS

The Post Office and Municipal Authorities urge that every house and property be clearly numbered. These Gothic type numerals are of solid aluminium, 4in high and of ⅜in triangular cross section. Body of numeral is dead black, apex bright aluminium as illustrated. Figures can be attached to mount bar so that the number is horizontal or oblique as desired. They are smart, easy to see and mount, and ever-lasting.

Prices: 1 figure and mount bar— 9/3 plus 2/- post.
2 figures and mount bar—15/- plus 2/- post.
3 figures and mount bar—20/9 plus 2/- post.

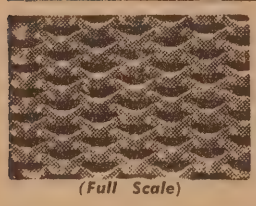
(Alphabetical letters of the same dimensions also available. Use our FAST QUOTE SERVICE.

ALUMINIUM CHASSIS
Spot Welded Ends

ALL POST FREE

6 x 4 x 2	4A13	7/6
8 x 5 x 2½	4A14	10/-
10 x 6 x 2½	4A15	12/-
11 x 8 x 2	4A16	14/-
13 x 7 x 2½	4A17	14/-
13 x 10 x 2½	4A18	17/6
17 x 8 x 3	4A19	22/6
17 x 10 x 3	4A19	25/6
17 x 12 x 3	4A21	26/6

First grade aluminium, carefully turned corners, easy to drill or punch. Special sizes. 50 pc more.



(Full Scale)

Expanded Aluminium

Suitable for speaker grilles, etc., can be used natural, or sprayed any colour.

13½in x 27in Alum. ... 30/-
18in x 27in Alum. ... 40/-
13½in x 27in Gold ... 35/-
18in x 27in Gold ... 45/-
½ sheets available. Pack and post, 2/-

Germanium Transistors and Diodes

(Get PHILIPS book "Transistors and Germanium Diodes" Price 5/6, Post Free.)

OC70	28/9, Post free.	OC44	55/-, Post free.
OC71	28/9, Post free.	OC45	55/-, Post free.
OC72	50/6. Post free.	4A42	Germanium Diode.
OC72	(Matched pair for push-pull circuits) 100/- Post free.		10/- Post free.

FAST QUOTE SERVICE

For quickest possible service, write on the left-hand side of a sheet of paper the radio parts that interest you — one beneath the other. If a kit, itemise. Add your name and address and send it to us with a stamped, self-addressed envelope. We will add the latest prices and return to you. Use this sheet as your order form and return to us with remittance for cost and postage as quoted. Goods will be sent same day. Any surplus refunded. Sorry, no C.O.D.

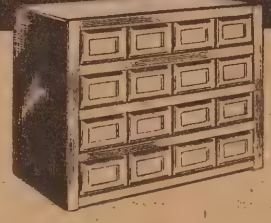
New Important Bernard Radio Publications

Post Free. Refer our "Fast Quote Service."

— 57	3/9	Ultra-Shortwave Handbook.
— 58	3/9	Radio Hints Manual.
— 61	3/9	Amateur Transmitter's Construction Manual.
— 65	3/9	Radio Designs Manual.
— 66	3/9	Communications Receivers' Manual.
— 68	3/9	Frequency Modulation Receivers' Manual.
— 69	3/9	Radio Inductance Manual.
— 70	3/9	Loudspeaker Manual.
— 71	3/9	Modern Battery Receivers' Manual.
— 78	3/9	Radio and Television Laboratory Manual.
— 80	6/9	Television Servicing Manual.
— 83	3/9	Radio Instruments and Their Construction.
— 90	4/6	Wireless Amplifier Manual, No. 2.
— 93	6/9	Power Pack Manual.
— 96	1/6	Crystal Set Construction.
— 97	4/6	Practical Radio for Beginners. Book 1.
—100	7/6	A Comprehensive Radio Valve Guide, Book 1.
—101	2/3	Two Valve Receivers.
—102	4/6	40 Circuits Using Germanium Diodes.
—103	2/3	"Radiofolder" A. The Master Colour Code Index for Radio and Television.
—104	2/3	Three Valve Receivers.
—106	3/9	Radio Circuits Handbook No. 4.
—112	3/9	"Radiofolder" C: An Electronic Multimeter.
—114	3/9	"Radiofolder" E. An inexpensive tape recorder.
—115	3/9	Constructors' Handbook of Germanium Circuits.
—118	4/6	Practical Coil Construction for Radio and Television.
—119	4/6	The Practical Superheterodyne Manual.
—123	2/3	"Radiofolder" F. The Beginners' Push-Pull Amplifier.
—126	3/9	The Boys' Book of Crystal Sets and Simple Circuits.
—127	5/3	Wireless Amplifier Manual No. 3.
—128	5/3	Practical Transistors and Transistor Circuits
—129	1/6	Universal Gram-motor Speed Indicator.
——	2/3	Servicing the Modern Radio Receiver.

Also No's 130-131-132-135-138-140-141-142.
Read back of any book for other publications.

STOP! FIND THOSE LITTLE THINGS FAST!



Model A—Cabinet 12in x 9in x 5½in. 16 drawers 5½in x 2 5/8in x 1½in.
Mod. B. 4 drawers 11in x 5½in x 1½in.
Mod. C. 4 drawers 5½in x 5½in x 3⅜in.
Mod. D. 8 small and 2 long drawers.
Mod. E. 8 small and 2 square drawers.
Mod. F. 4 small, 1 long, 2 square drawers.
Mod. G. 9 drawers 5½in x 3½in x 2 1/8in.
Mod. H. As Mod. A—but fitted with divisions.
Mod. J. As Mod. B—but fitted with divisions.

Send self-addressed stamped envelope for illustrated leaflet. These all-steel COLRAD craftsman-built handy cabinets, attractively finished in baked grey hammertone enamel with provision for fitting identification card on each drawer. A strong and most useful cabinet for holding small parts or tools. Ideal for mechanic, engineer, garage or home workshop. Provision is made for stacking into units **48/-**
OVERALL SIZE 11½in wide, 9in high, 5½in deep.
Postage: Vic., 3/8. N.S.W., A.C.T., S.A., Tas., 6/-; Qld., W.A., N.T., 8/4.

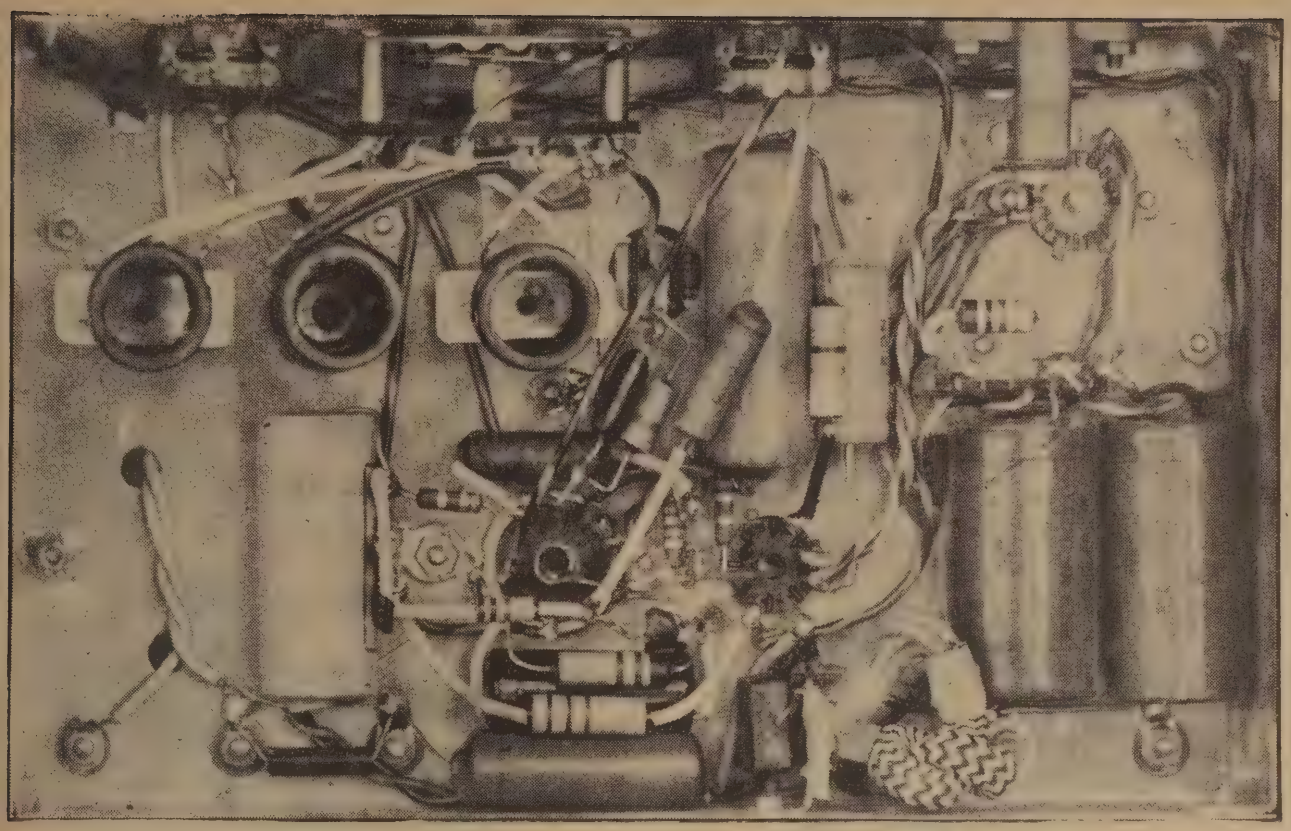
THE NEW! "Q-PLUS" CRYSTAL SET

- PERMEABILITY TUNED.
- LITZ WIRE COIL
- GERMANIUM DIODE DETECTOR.
- COMPACT.
- PLASTIC CABINET 5in x 3in x 3in.
- THE MIGHTY ATOM.

EXTRAS:—
100ft Aerial ... 7/6
BROWNS Sensitive Phones ..49/6
or 4K17 Disposals Phones ...25/-

49/6
PLUS 2/- POSTAGE.

EVERYTHING FOR THE RADIO AND ELECTRICAL EXPERIMENTOR



Almost every component beneath the chassis can be seen from this picture.

and regeneration up. Connecting an aerial should bring in stations varying in strength with the length of aerial used. Since the length of aerial has some effect on the tuned circuit, a series capacitor of small value may be desirable with long aerials to minimise the loading effects of the aerial on the tuned circuit.

On the broadcast band, adequate selectivity and signal strength was obtained with only several feet of wire on the floor, in an average locality.

Having completed all the preliminaries, you can settle down to many hours of enjoyable listening—a rewarding experience for the efforts in putting a few components together.

COIL WINDING

A few notes on coil winding and adjustments may be of benefit to those who are building a regenerative set for the first time.

Exact coil requirements for any individual set are to some extent affected by associated components and reception conditions. Although the specifications we gave are for an average set of conditions some improvement to the performance may be achieved by a little experimenting.

Should a receiver prove too unselective, try the effect of reducing the number of turns on the primary winding and/or increasing the spacing between primary and secondary. Should the opposite effect be desired reverse the procedure.

Regeneration which is too sudden may be tamed by placing the cathode tap lower on the grid winding. Should regeneration fall away on the low frequency end of the band, placing the tap higher on the grid winding should cure this fault.

The coils in this receiver were designed for three bands, the first to cover from about 600 Kc to about 2.2 Mc, the second from about 3 Mc to 12 Mc and the third from about 8 Mc to 30 Mc. Should you require it, the coils may be made to tune slightly higher or lower simply by removing or adding turns to the tuned grid winding.

As mentioned earlier, a calibrated arm paper dial scale is available through the query service. This scale is intended for mounting on the dial frame behind the pointer and requires the removal of the existing calibrations on the glass. Its use however, presupposes the coils and tuning capacitor to be identical with our specifications.

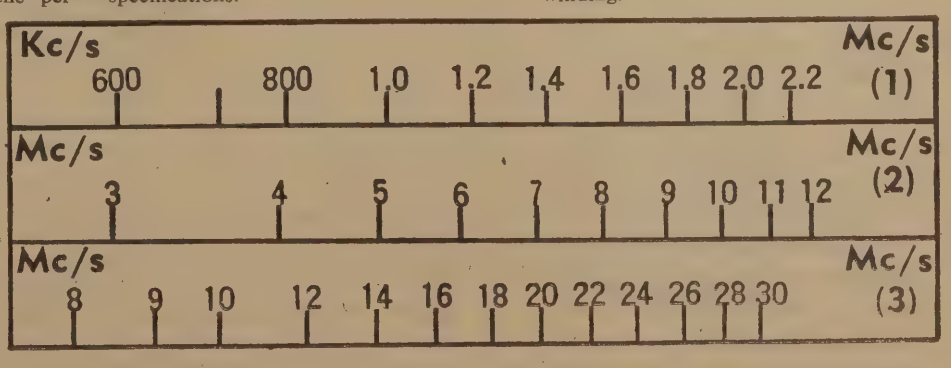
Should the coils and capacitor vary or should you desire to do it yourself, there is no reason why an accurate set of calibrations should not be made with the aid of a service oscillator.

Since there are no tuned circuits to adjust, calibration simply consists of tuning the receiver to correspond to a setting on the oscillator and marking this frequency on the dial.

OPTIONAL PANEL

The final appearance and mounting of the set are best left to the individual choice of the reader. A panel was specified for the original set but this has been made optional in the present version simply because some may prefer to mount the set directly behind the wooden panel of a cabinet while others would require a metal panel for rack mounting in the workshop.

Dial lamps are not shown in the photographs but may be easily added if desired. Some 150/30 power transformers may have a separate 5 volt winding and the dial lamps may be connected to this winding.



This scale was made to fit our original set. Copies on good paper can be obtained through our Query Service for a 2/- postal note.

THE OLDEST TAPE-RECORDER MANUFACTURERS

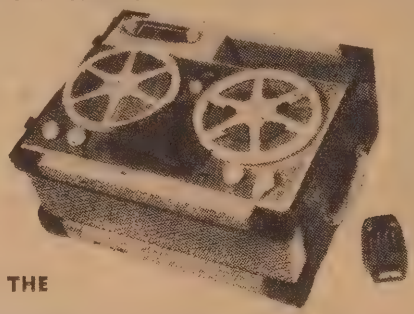
"NOVATAPE"

MAKE THE MOST MODERN EQUIPMENT

SINGLE-KNOB CONTROL PUSH-BUTTON

OR

"STUDIO" Three speed (1⅞, 3¾, 7½), three motor, 7-inch reel model with 2 heads or 3 heads. With a 3 HEAD Recorder direct comparison between the incoming sound and the recorder sound can be made IMMEDIATELY, thus enabling the correct level, etc. 100 pc recording assured under all conditions.



"SONIC-MIDGET" A REVOLUTIONARY DESIGN OF AN EXTRA LIGHTWEIGHT HI-FI RECORDER, AUSTRALIA HAS BEEN WAITING FOR. 3¾" sec, 5¾" Reels (1200ft.). Two Tracks, 14lb weight, place finder, 12" x 9" x 6"

ALSO THE

"ECHO-ETTE" (Two speed, 5¼inch reels) lightweight (19lb) in zip carrying bag

Commercial pre-recorded tapes and tapes from broadcast stations will play perfectly, as all "Novatape" recorders are fully designed to C.C.I.R. standards.

CALL OR WRITE FOR FURTHER DETAILS TO CONVINCE YOURSELF OF ITS FEATURES

★ The most simple and efficient ONE KNOB Tape Control giving definitely no spilling of tape.
★ 40 second Fast Forward and Rewind.
★ Instant but resilient "Differential" Brakes.
★ Counter. Placefinder. (Built-in).
★ Guaranteed Frequency Response.
★ Up to 5000 c/s at 1 7/8in/sec without flutter or wow (good quality for music).
★ Up to 9000 c/s at 3¾in/sec and up to 14000 c/s at 7½in/sec. both giving HIFI reproduction.
(15in/sec also available)

We offer to send ON APPROVAL to districts without representation WITHOUT OBLIGATION TO BUY. Please write for details and we will be glad to assist you

To make room for our stocks of new recorders we are anxious to dispose of a number of TRADE-INS and DEMO recorders at BARGAIN PRICES

NOVA Type A with Radiotuner £95
PYROX/AWA MAGICTAPE, 7½in £65
Magnegraph 7½in two track (one left only) £65
"FILMAG" 8 mm Unit (Demo) £65

NOVA Type 00 in two cases, THREE head, new £192. Only £85
Here is Your Chance. Don't Miss It.
New plastic tape, 38/6. AEROVOX Plastic Tapes, extra sensitive, only 51/9 each.

ULTRALINEAR O/P TRANSFORMERS

FOR EVERY TYPE OF VALVE. "Nova" pioneered "Ultralinear" in Australia.
UP to 12 WATT (2 impedances), £4/17/6.
UP to 20 WATT (2 impedances), £6/3/-.
Other types on application.
O/P Transformers for Playmaster 1 to 11 and for the

Mullard 5-10 and 20 watt Amplifier Transformers Kit Sets.

T.V. Transformers for R & H, PHILIPS and A.W.A. TV—RECEIVERS

Transistor Tranformers to R & H and other specifications.

Rewinds and any type transformer or coil, to customer's specifications.
Call, ring or write for quote on your needs

TERMS ON LOW DEPOSIT

For further details contact your dealer or

"NOVA"

311 SUSSEX ST., SYDNEY. BM6138-BM2350.

Open Saturday mornings and week nights

MELBOURNE: WILLIAM WILLIS and CO. PTY. LTD., 428 Bourke St. MU2426. R. WALLER, 89 Hawthorn Rd., Caulfield, LF2921. T. BALE, 41 Roslyn St., Burwood, Vic. BW1468.

CUT OUT HERE

Please send without further obligation details of 8/57

NAME .....

ADDRESS .....

I enclose LARGE self-addressed envelope and 9d in stamps.

NEW BOOKS

R.C.A. RECEIVING TUBE MANUAL (Technical Series RC-18), Tube Division, Radio Corporation of America, Harrison, N.J., 8 3-8in by 5 3-8in, soft cover, 352 pages.

The latest edition of an "old familiar" retains the general size and style of previous editions with revisions and additions. The first 65 pages approx. is devoted to valve fundamentals which leads on to information on valve information and guidance on the interpretation of valve data. This part of the manual is almost a textbook in its own right and, we consider, one of the most valuable features.

There follows data on more than 575 receiving valve types current with R.C.A. Many of these types are, of course, also current with many other valve companies throughout the world.

For the less popular valves the socket connections plus a brief description is given while expanded data, curves and typical operating conditions are given for those types in more general use.

TV PICTURE TUBES

A television picture tube characteristics chart giving brief data on current R.C.A. picture tubes occupies some six pages.

There is further descriptive information on valve testing, resistance coupled amplifiers and finally a section containing 22 circuits to illustrate typical applications of R.C.A. valves. Projects include receivers, amplifiers and test equipment.

The general quality of the book; drawings, paper, binding, etc., is excellent and we have no hesitation in recommending it as excellent value for the money.

Our copy from the Technical Book and Magazine Company, 295 Swanson Street, Melbourne, C.1. The price is 10/ plus 1/ postage and packing. (M.V.F.)

★ ★ ★

R.C.A. TRANSMITTING TUBE MANUAL (Technical Manual TT-4), Tube Division, Radio Corporation of America, Harrison, N.J., 8 3-8in by 5 3-8in, soft cover, 256 pages.

Many of the comments made with regard to the R.C.A. Receiving Tube Manual also apply to this volume which is an excellent guide to transmitting valves and transmitter practice. As with the receiving manual, it is well worth having on hand for quick reference, even when more detailed information is available.

Our copy from the Technical Book and Magazine Company, 295 Swanson Street, Melbourne, C.1. The price is 13/6 plus 1/ postage and packing. (M.V.F.)

TRANSISTORS, Circuits and Servicing, by B. R. A. Bettridge, A. M. Britt, I.R.E. Published for the Wireless and Electrical Trader by the Trader Publishing Co., May, 1957, 23 pages. 8¾in by 6in, soft cover.

Service engineers will find themselves meeting transistors more frequently in their daily routine from now on and it is the purpose of this volume to give them a brief introduction to transistor circuits and transistor peculiarities.

Involved theory and mathematics are avoided in order to achieve the desired result. One of the sections discusses the design of a small transistor superhet and points out features which are of particular interest in service work.

The book is not expensive. English price is 2/6 plus postage. Our copy direct from the Trader Publishing Co., Dorset House, Stamford Street, London.

For the finest in Sound

BRAMCO

HI-FI TRANSFORMERS

Manufactured by

BRAMCO RADIO COMPONENTS

83 & 91 Nelson Street ::: WALLSEND, N.S.W.

Every car needs its own "EVEREADY" flashlight

BRAND

Keep it in the glove box **always**—filled with dependable "Eveready" "Nine Lives" batteries for longer life, brighter light.

Then you'll be able to look for the cause of engine trouble — check street signs and numbers at night — you're prepared for **any** emergency.

"Eveready" "Nine Lives" and the Cat Symbol are the registered trade marks of Eveready (Australia) Pty. Ltd., Rosebery, N.S.W

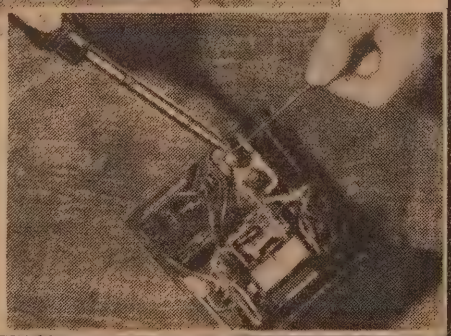
E978/7

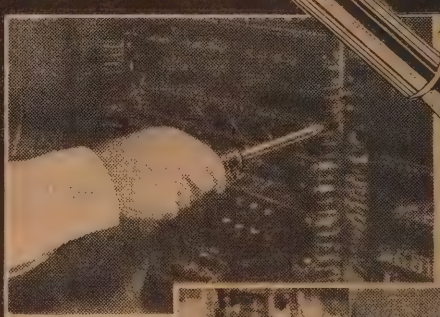
SCOPE...

the most widely-used soldering iron in Australia

. . . is now exported to England and U.S.A.

The unique and versatile Scope Soldering Iron owes its popularity to these time-saving and dependable features—HEATS IN 6 SECONDS . . . ready for continuous use. Subsequent heating practically instantaneous. SMALL DIMENSIONS AND LIGHT WEIGHT, only 3½ ozs., permit easy access to awkward places. AMAZING SOLDERING SPEED ACHIEVED with a small tip which is used purely as a means of transferring the heat to the work . . . and not as a reservoir of heat as with other irons. DOES NOT RADIATE HEAT IN ALL DIRECTIONS as heat is localised at the solder tip. Soldering is possible in a maze of wiring as the barrel is comparatively cool.





• *A DEMONSTRATION at your usual supplier will convince you Scope is the best soldering iron available.*

SMALL TIP makes Scope ideally suitable for Radio, Television and all electronic equipment soldering.
IS ABSOLUTELY SAFE. Scope operates on 2.5/6.3 volts AC or DC, through National Transformer (optionally supplied), or from a car battery.

Retail Price 50/-

National Transformer 49/7. Fully approved under Prescribed Articles of the Electricity Authority. Approval No. N/156

Australian & Overseas Agents:

Wm. J. McLELLAN & Co. Pty. Ltd.

126 SUSSEX ST., (just north of King St.) SYDNEY. BX1131

New Zealand Distributors: H. W. Clarke, Auckland and Wellington

FROM THE SERVICEMAN WHO TELLS

When is a set too old to repair economically? This may be a hard question to answer, but one I had this month must surely be a borderline case. At the other extreme I was faced with a 16 mm projector suffering from a puzzling "slow fade" but which turned out to be quite simple after all.

FIRST, however, in the absence of any worth-while T.V. faults, I can at least relate some interesting incidents. Besides being mildly amusing, they surely demonstrate just how tangled up the average citizen can become, particularly when, as I suspect, his only source of knowledge is the average T.V. salesman.

The first is a little sidelight on the almost endless controversy on T.V. screen sizes, a controversy which, incidentally, has led to some pretty acrimonious discussions between the adherents to the two most popular sizes, the 17-inch and the 21-inch.

Personally, I try to keep out of such discussions, at least during business hours, and confine my comments to correcting grossly erroneous ideas and supplying such facts as may help a customer to make his own decision.

WHAT IS IDEAL?

In any case, any discussion on what is an "ideal" size would seem to be about as pointless as trying to pin down an "ideal" car, an "ideal" house, or even an "ideal" pretty girl! Personal ideas and requirements are so varied that no one design of anything can possibly suit everyone.

Yet it is quite surprising the number of times I am asked to nominate the "best" size screen; something I steer clear of, at least until I have some idea of the size of room involved and the probable viewing habits.

Equally surprising are some of the erroneous ideas. One woman asked me, in all seriousness, whether it was true that a 17-inch set would not be suitable for receiving color T.V. transmissions—assuming that these were likely to eventuate in the near future. Someone, it seemed, had advised her most emphatically that this was so and that it would therefore be unwise to invest in a 17-inch set.

NO DIFFERENCE

I assured her that (1) a 17-inch set was just as capable of receiving a compatible color transmission as any other, and (2) that there was little likelihood of this problem worrying her in the immediate future. Since a 17-inch set seemed to suit her requirements in all other respects, she was grateful to have this last doubt removed.

Another housewife came up with an even better one. It concerned a distant relation of hers who, in spite of the fact that he now lives within range of our T.V. system, is a typical country type who has spent all his life in the "bush."

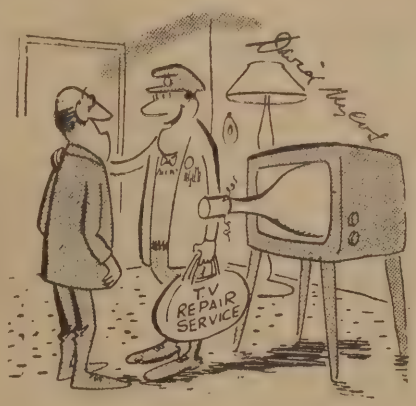
During a recent visit to the city (it's less than 50 miles, yet he still "visits" the city in traditional style) he announced his intention of buying a T.V set, and was most emphatic that it was going to be a 21-inch type. In fact, he went to considerable trouble to point out all the disadvantages of the 17-inch varieties, in spite of the fact that his host—my customer—had already invested in one of the latter.

His crowning faux pas was when he used his host's set to demonstrate one of these points. "See that!" he exclaimed, pointing to a sporting scene in which the cameraman had inadvertently "amputated" the feet of the contestants. "That wouldn't happen on a 21-inch set. You'd be able to see the bloke's feet properly. You lose half the picture on these little screens."

AN ARGUMENT

This was too much for his host. Unable to contain herself any longer, she immediately queried the accuracy of his statement. The result was a long and somewhat heated argument, with both parties sticking rigidly to their convictions. Naturally, it was completely inconclusive, since there was no one with sufficient knowledge to settle the point.

However, the lady was not going to be beaten. Her main purpose in telling me the story was to get a ruling on the problem—even though she felt sure she was right anyway. I was happy to be



"Now—are you sure you haven't been trying to fix it yourself?"

able to confirm this and also explain, in simple language, why it was so.

Thus fortified, she announced her intention of going forth to battle once more. And, judging by the glint in her eye, I began to feel almost sorry for the country cousin!

Finally, there was an incident concerning a T.V. aerial. A casual business acquaintance approached me for some advice concerning his particular problem and, even though it was outside business hours and would not afford me any direct remuneration, I said I would be happy to help him if I could.

[Quite apart from any charitable inclinations on my part, I did not overlook the fact that his position in the community would make him an excellent advertising agent—even if he was unaware of his role.]

It seemed that he had recently acquired a T.V. set and was operating it from a simple indoor aerial sitting on top of his receiver. His location was such that he received plenty of signal strength and virtually no ghosting from both Channel 7 and Channel 9.

His only complaint concerned Channel 2, which was markedly weaker than the others and marred by "snow." At the same time, he felt that this was probably only a temporary condition, due to the limited power and aerial height of this transmitter, while awaiting the erection of their tower.

SIMPLE AERIAL

For this reason he hesitated to go to the trouble and expense of fitting an elaborate outdoor aerial which, he felt, would be quite unnecessary in a few months' time. Could I suggest something simple he could use to improve the performance of Channel 2 in the meantime?

I said I thought something could probably be done, and set about explaining how to make a simple ribbon folded dipole, roughly resonant on Channel 2, and which I suggested he mount under the tiled roof of his house.

When I started to explain the nature and general appearance of 300 ohm ribbon, I was surprised to discover that he seemed to be better acquainted with this material than I had expected. In the circumstances, I wasted no more time on this, going straight on to describe how to make the aerial.

I suggested that he start with a length of ribbon about 7ft long (I couldn't remember the exact number of inches, but said I would tell him later), short circuit each end, then cut one of the conductors in the middle to form a take-off point for the signal. From here, another length of ribbon would be used to convey the signal to the set in the usual way.

ROUGH SKETCH

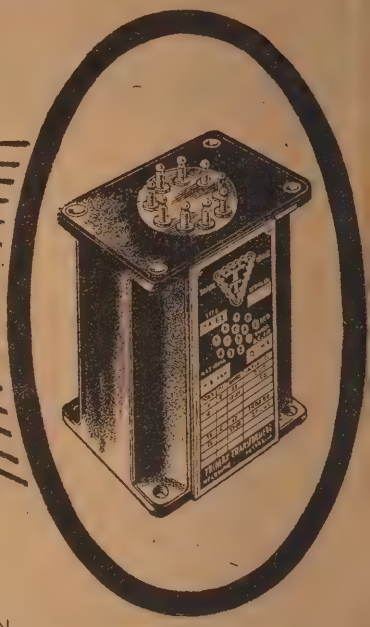
I drew a rough diagram on the back of an old envelope, then went on to explain how the di-pole section could be fastened to the rafters with cord to keep it taut. Finally, I mentioned a few points about correct orientation. Whereupon my friend expressed his gratitude, and we went our respective ways. I felt I had done my good deed for the day.

A week or so later I met him again.

"Well," I inquired. "how's the T.V. aerial working out?"

"No good, I'm afraid," he replied, with evident disappointment. "In fact, it didn't work as well as the one I had."

TRIMAX IS WAY AHEAD IN RELIABILITY PERFORMANCE & QUALITY!



Choose TRIMAX because exhaustive technical research moders methods of manufacture and rigid performance tests guarantee you a thoroughly reliable product

OUR RANGE INCLUDES:

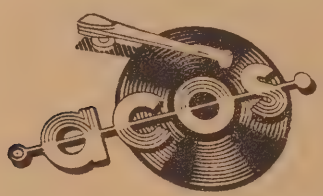
- POWER Transformers
- AUDIO Transformers
- CURRENT Transformers
- AUDIO Amplifiers
- POWER Amplifiers
- POWER & AUDIO CHOKES
- ELECTRICAL CONNECTORS
- MICROPHONE STANDS
- TEST EQUIPMENT
- SOLENOIDS
- TV & RADIO Protective Metal Work, etc.

TRIMAX TRANSFORMERS PTY. LTD.

AGENTS IN ALL STATES

CNR. WILLIAMS RD. & CHARLES ST., NORTH COBURG, VIC. Phone FL1203

YOUR RECORDS DESERVE NOTHING BUT PERFECTION



REPLACEMENT STYLI

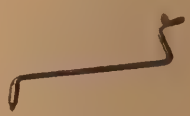
There is a correct stylus for each type of Acos pickup. Ensure that these only are used as replacements. All Acos styli are manufactured to rigid specifications.

SB-1 for standard 78 r.p.m. records
SB-2 for microgroove 33⅓/45 r.p.m records. Use with Acos G.P.19, G.P.27, H.G.P.35, H.G.P.39, H.G.P.41 and H.G.P.45 cartridges.

SC-1 for standard 78 r.p.m. records.
SC-2 for microgroove 33⅓/45 records. Use with Acos G.P.25 and G.P.29 series turnover cartridges.

SD-1 for standard 78 r.p.m. records.
SD-2 for microgroove 33⅓/45 r.p.m. records. Use with Acos H.G.P.33 series turnover cartridges and with Acos H.G.P. 33⅓/Garrard and Acos H.G.P. 33⅓/Collaro replacement pick-up heads.

SE-1 for standard 78 r.p.m. records.
SE-2 for microgroove 33⅓/45 r.p.m. records. Use with Acos H.G.P.37 series turnover cartridges and with Acos H.G.P.37/Garrard and H.G.P. 37/Collaro replacement pick-up heads.



SK-1 for standard 78 r.p.m. records.
SK-2 for microgroove 33⅓/45 r.p.m. records. Use with Acos G.P.59 cartridges.

SL-1 for standard 78 r.p.m. records
SL-2 for microgroove 33⅓/45 r.p.m. records. Use with Acos G.P.61 cartridges.

ALL STYLI ARE *INDIVIDUALLY* PACKED

Sapphire Styli, all 12/- each.
Diamond Styli also available as follows:

SB1	Diamond	Price: £9/15/- each
SB2	"	
SE1	"	
SE2	"	

AMPLION (A'SIA) PTY. LTD.

88 Parramatta Road, Camperdown, Sydney, N.S.W. 'Phone LA 6124

***Victorian Distributors:* DISTRIBUTORS CORPORATION PTY. LTD., 403 Bourke St., Melbourne.**

Since this just didn't make sense, I pressed for further details. Had he constructed it as I described? Had he used the correct type of ribbon? And so on.

In particular I wanted to know about the ribbon. What kind of ribbon was it?

"Oh, just ordinary twin ribbon."

Where had he bought it?

"Woolworths," came the rather surprising reply.

"Woolworths!" I exclaimed. Now I was sure something was wrong. Woolworths, with all due respect to that worthy retailing organisation, has not, as yet, reached the stage of selling 300 ohm twin-feeder ribbon.

It was now obvious what had happened. To my friend, all twin cable was alike, and he had simply purchased several yards of twin plastic lighting flex. As far as I have been able to determine the natural impedance of this is nearer 120 ohms than 300.

A LONG WAY OUT

But that was not all. Further questioning elicited the fact that the length of the aerial portion was quite random. Admittedly, I might have sounded a trifle vague in suggesting "about seven feet," but he was even more vague about my vagueness—if you get what I mean.

To cap it all, he couldn't be quite sure whether he had even connected the section of ribbon as I had prescribed. (Apparently the old broadcast band habit of using any odd piece of wire dies very hard.) The final result must have been just about as far from optimum as one could get.

I'm afraid it's all very discouraging.

Reverting to conventional radio receivers my first case concerns a rather ancient mantel set. It belonged to a widow whose financial circumstances were such that she was obviously not anxious to spend a great deal of money on it. In fact, when she brought it into the shop she suggested—probably as a result of wishful thinking—that there was ". . . just some little thing wrong with it."

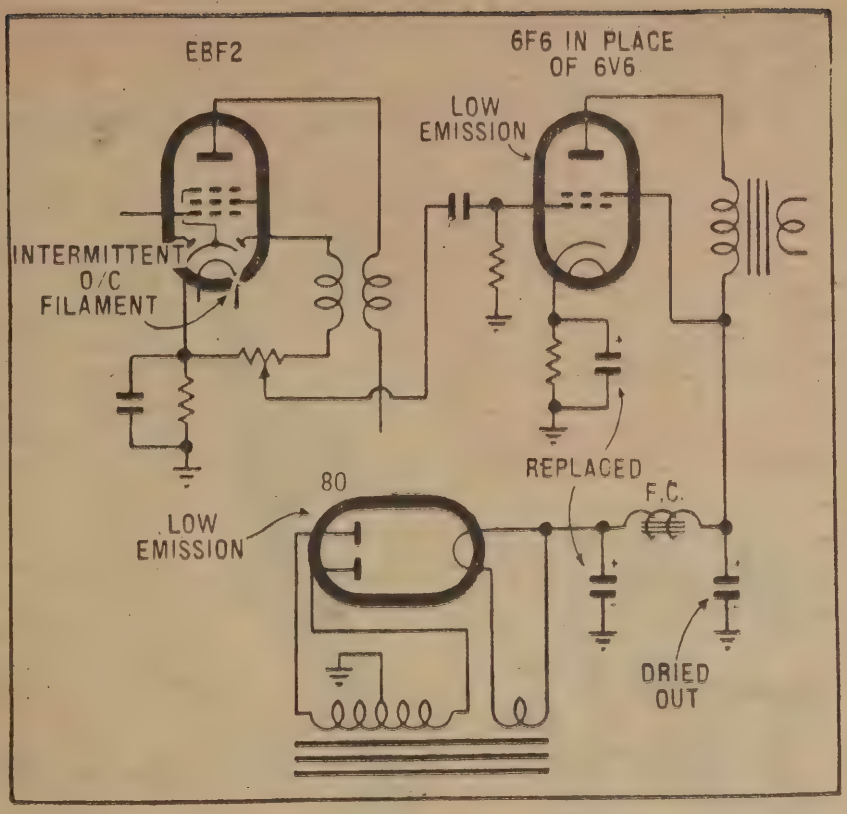
The model was one which, as nearly as I can remember, first made its appearance about 1940, though this particular set may have been a slightly later version. Prior to this it had been a simple four-valve broadcast mantel receiver, until someone conceived the bright idea of producing a dual-wave version.

A COMPROMISE

Since it had never been intended for such a role there was very little room to mount the extra coils and no place to fit a wave-change knob. The problem was overcome by mounting the coil bracket on top of the gang and locating the knob at the rear of the cabinet, but the final result always looked exactly what it was—very much a compromise.

With the set still in the cabinet I switched it on and tuned it over the band. It was just about as weak as a set can be (and still work), as well as having the most atrocious distortion in the output. I didn't think much of the chances of it being a "little thing."

Next I commenced to take the chassis out of the cabinet. This proved to be quite a job and for a rather unusual reason. The chassis was held in place by four bolts passing through the bottom of the cabinet and, as is customary, these were also used to secure four rubber feet.



These alterations fixed an old set which had a collection of faults.

At least they had been rubber feet once. With the passing of time the rubber had undergone many chemical changes and slowly deteriorated into a gooey mess. When this had first happened the owner had apparently noticed that the feet were marking the furniture and had placed a sheet of paper under the set.

PAPER "FEET"

Later still it was noticed that the rubber had penetrated the paper and a fresh sheet was supplied; only to meet the same fate a few months later. Thus it was that I was faced with a now-hardened lump of rubber-cum-paper which completely enveloped the head of each bolt. And, believe me, it was really messy.

I hacked and pried at it with a variety of tools, such as screwdrivers, sidecutters, etc., finally settling for a discarded carpenter's chisel. It wasn't particularly sharp—for a chisel—but it did cut the mess away better than anything else.

Eventually I was able to expose the head of each bolt, clean out the recess and finally unscrewed it. Then I slipped the chassis out of the cabinet—and the speaker fell out after it.

Investigation showed that the speaker had been mounted on a cardboard baffle by means of four screws, while the baffle had been fastened to the cabinet by means of four clips. Of the four screws only one now remained, while the clips were loose and right out of position. As a result the only thing which kept the speaker in the cabinet was the chassis.

With the set on the bench I made a quick voltage check. The HT was around 250v, which seemed a trifle high, while the bias across the 6F6 bias resistor was only six, which was very definitely low.

It was while checking up on these voltages that I made another discovery. The 6F6 appeared to be a "foreigner," the stamping on the chassis clearly showing a 6V6. How or when this change had occurred I had no means of knowing, though I suspect it may have been a result of wartime shortages.

In fact, since the valve appeared to be of the same vintage as the 80, it is quite probable that this change was made at the factory. The two valves are sufficiently alike to allow this to be done without any changes to some circuits. The pin connections are identical, and the bias resistor often the same. To be sure, the load requirements are different, but this is more academic than real. Of rather more significance would be the reduced sensitivity, but even this would not be really serious.

FACTORY SUBSTITUTE?

Remembering how things were during the war years, it is not hard to visualise a factory making such a substitute in order to clear a batch of chassis during a temporary shortage of 6V6s.

Reverting to the more immediate problem, I plugged the 6F6 in the tester and, as I expected, found it to be very sick. The 80 was in a similar condition and had only been able to deliver enough voltage to keep the remainder of the set going by reason of the weak 6F6.

I replaced both valves, using a 6V6 this time, and this immediately restored most of the lost sensitivity. However, the reproduction was still very thin and the audio stage "motor-boated" badly when the volume control was advanced.

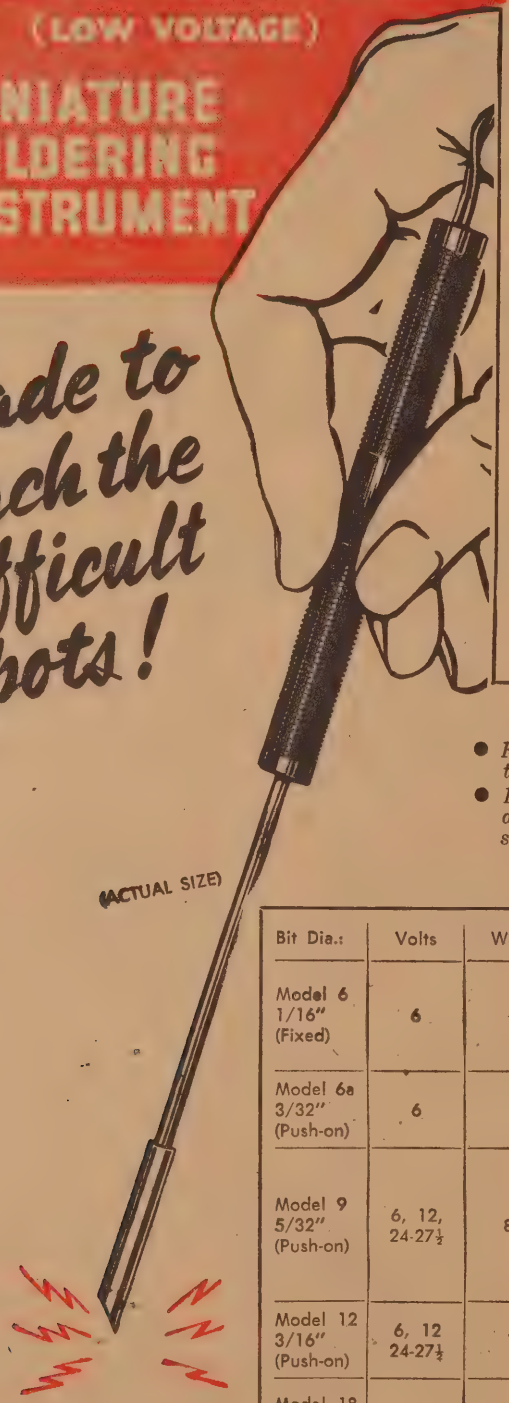
A new second electrolytic soon cured

ORYX

(LOW VOLTAGE)

MINIATURE SOLDERING INSTRUMENT

Made to reach the difficult spots!



(ACTUAL SIZE)

cut TIME and LABOUR with ORYX

The Oryx is an amazingly light-weight soldering instrument with which the operator can reach INSTANTLY even the most awkward spots in assemblies. It weighs less than 1 oz., yet is robustly constructed for long life. It operates on low-voltage; thus is completely safe. There are no ceramic formers to break, no mica to flake.

The ORYX long life element will outlast several bits which are of tight push-on fit. NINETY PER CENT. of instrument makers in Britain use the ORYX. Cut down time and expense by using the ORYX in YOUR laboratory or assembly department.

Take the OLD out of Soldering with ORYX

- *Fast heating element, ready for operation in less than one minute.*
- *Exclusive design features resulting in universal acceptance of ORYX as the standard miniature soldering instrument.*

Bit Dia.:	Volts	Watts	Nett Weight	Length	Recommended Use
Model 6 1/16" (Fixed)	6	6	0.25 oz.	6"	Electrical measuring instrument fine assemblies, hairsprings, R.F. pick-up & speech coils, hearing aid sub-assemblies, etc.
Model 6a 3/32" (Push-on)	6	6	0.25 oz.	6"	As for Model 6 (for extremely delicate work only).
Model 9 5/32" (Push-on)	6, 12, 24-27½	8.3	0.25 oz.	6"	Hearing Aids, Midget Radios, Personal Receivers, Radio and T/V Sub assemblies, Coils, Electronics, Instruments, Model Construction Electro-Medical, etc.
Model 12 3/16" (Push-on)	6, 12 24-27½	12	0.5 oz.	6.25"	Radio, Television and Telecommunications assemblies.
Model 18 3/16" (Push-on)	6	18	0.75 oz.	7½"	For heavier work, heat capacity equivalent to that of most 80 watt soldering irons.

Australian Agents:

MANUFACTURERS SPECIAL PRODUCTS PTY. LTD.

47 YORK STREET, SYDNEY — B 0233 — EXT. 279

doubt about the remaining ones. I had no wish to involve the owner in more expense than was absolutely necessary, yet I felt obliged to replace any component which might be in doubt. After all, it would cost a good deal more to replace them at a later date, and they were obviously as old as the faulty one.

I finally decided that I would do the best by the owner if I changed the others, including the 10 mfd on the 6V6 cathode resistor. The set was now performing reasonably well, except that the short-wave section was completely dead. All things considered, I thought it best to ignore this, for it was obviously of no interest and would only involve unnecessary expense.

NOISY CONTROL

The only other apparent fault was a noisy volume control and, much as I regretted it, there seemed no way out of replacing this also. I could only hope there would be nothing more wrong.

But there was. While giving it a test run (on my favourite program) the volume commenced to drop slowly, eventually fading away completely. After a minute or so the signals slowly returned of their own accord. In the meantime, of course, I had pounced on the set and checked each valve heater; the most likely cause of such symptoms.

It turned out to be the EBF2 IF amplifier/detector and I had visions of having to replace this also. Fortunately, there was a chance of salvaging it. A frequent cause of such troubles is a faulty soldered joint in the base pin, the lead wires from inside the glass envelope being of an alloy which needs careful cleaning for effective soldering. (The modern "baseless" valves eliminate this weakness.)

The fault can usually be cured by the simple application of a hot soldering iron with plenty of flux and solder. Furthermore, I have no compunction about using some of the more potent paste fluxes which one might be inclined to condemn for other applications. After all, corrosion is not likely to be a problem in such circumstances, while the need to make a good joint is most important.

SEEMED OKAY

This time it looked as though my customer's luck had changed. After giving the base pins "the treatment" I gave the set a prolonged bench test, but could not induce the trouble again. I finally decided that it was cured.

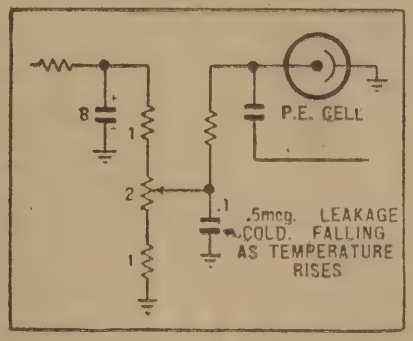
And that was about all I could do for the set, within reason, though I must admit that I wasn't particularly happy about it. The resistors were of a type—now discontinued — which were never very reliable, while most of the paper capacitors had bulged ends and badly cracked sealing compound.

By rights, most of them should have been replaced, since any one could fail at any time. Yet I had to draw the line somewhere, and the owner was already committed for more than we had both hoped. All I could do was return the set, detail what I had already done, and explain that there was still a risk that other sections might fail at any time. I also pointed out that it was reaching the stage where servicing would become progressively less economical, and where a new set would be a better proposition.

Making a rapid change of scene, my next story is about a 16 mm sound system. This particular piece of equipment was not new to me, the owner being a friend as well as a customer, and we had tackled this particular piece of equipment together on more than one occasion.

This time he complained of a somewhat puzzling variation in sound sensitivity. He hastened to explain that this was something more than the variation between soundtracks—in itself a very wide one—or the inevitable variations in effective line voltage due to the need to use a 110 step-down transformer.

No, it was something less tangible than this: a gradual loss of gain which seemed to get worse the longer the equipment



Temperature variations altered the insulation resistance of this condenser.

was run at any one session. Then, at the next session, it would be back to normal, at least at the start.

Fortunately, he was able to provide a very vital clue. It seemed that the loss could be compensated by adjustment of the P.E. cell voltage control, a form of auxiliary volume or sensitivity control. As its name suggests, it varied the voltage on the P.E. cell, being a 2 meg. pot. as part of a voltage divider across the main HT line.

This information was important, because there is a definite limit to the voltage which may be applied to such cells. As with all gas-filled tubes, ionisation will take place at a certain critical voltage, in this case about 90. When this happens, the cell "motor-boats" violently, indicating that the voltage should be reduced.

However, when the system lost sensitivity, the voltage control could be advanced to compensate without causing ionisation, no matter how close it had been set to this point when the gear was first set up. Therefore, it seemed certain that the fault lay in the voltage supply to the P.E. cell.

PROBABLE COMPONENTS

We took a quick look at the appropriate part of the circuit and found a handful of components which could cause the trouble. Some were resistors, and there were at least two capacitors. One of the latter was an electrolytic used to decouple the voltage divider from the main HT line. The other was a paper .1 mfd from the moving arm of the pot. to chassis.

A preliminary check with the ohm meter showed all resistor values to be correct and, although not conclusive, did suggest that these were probably OK. Likewise, a voltage check across the decoupling electro, showed no change in voltage over a reasonable time. Again this was not conclusive, but still valuable.

This left the .1 mfd decoupler on the moving arm of the pot. and which, if leaky, could easily wreck the voltage distribution. Mainly because it was easy to get at, I unsoldered it from the circuit and connected it across the resistance range of the VTVM. It immediately pushed the needle back to 50 megohms. This seemed rather significant, since it is not usually possible to measure the resistance of a good capacitor.

At the same time, this was not sufficient explanation in itself, since 50 megohms would not upset the circuit unduly. Also, where was the steady drift we had been seeking?

I picked up the soldering iron and held it under the suspect capacitor. After a minute or so I thought I detected a slight drop in resistance, and in another minute I was sure of it. I rigged the iron so that it would sit two or three inches below the capacitor without my aid, and we left it for a few minutes while we chatted.

FALLING FAST

When I looked again, the needle was down to 20 megs., and falling fast. We checked it again at brief intervals, and it was still dropping merrily. Finally, at about the 1 meg. mark, it seemed to slow up a little, and I terminated the experiment. As far as I was concerned, the mystery was solved.

We fitted a new .1 mfd—one of the modern high temperature variety this time—and my friend went on his way a good deal happier about his equipment. Subsequent observation over a number of shows confirmed that the trouble had been cured.

The explanation, of course, is quite simple. There was enough heat present in the amplifier to cause a serious drop in resistance of the faulty capacitor, even though it probably took a lot longer than it had on the bench. Thus the voltage to the cell slowly dropped, and the sensitivity along with it.

I wish they were all as easy as that!

THIS IS THE BOOK—

TELEVISION FUNDAMENTALS, THEORY, CIRCUITS, AND SERVICING

BY FOWLER & LIPPERT

For Radio Technicians and Students who may eventually have the responsibility for installing and servicing Television Sets.

517 pages—9in x 6in—hundreds of drawings. Price 59/-, plus registered postage 3/-. Write us for list of its contents.

ASSOCIATED TRADE JOURNALS CO. PTY. LTD.,

N.Z.L. House, 42 Bridge Street, Sydney. Sydney Phone BU4091.

"Q-PLUS" ALIGNMENT AIDS FOR RADIO & T-V

NOW AT REDUCED PRICES

NOW! THE Q-PLUS "CORE LOCKING COMPOUND"

A specially formulated compound for sealing threaded iron cores in formers.
Not a wax, not a "glue."
Will NOT harden, soften, dry out with age, heat or cold.
Lubricates as it locks.
Core remains in position even under severe vibration.
All this means —
NO more cores coming loose after alignment.
NO more cores hopelessly glued or stuck, making re-alignment impossible.
NO more trying to drop wax, lacquer or glue in coil formers.
NOW cores will not move out of position, but can be re-aligned at any time in the future — even many years later.

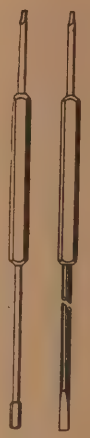
Because of the special lubricating properties of the Q-Plus core locking compound, cores which tend to bind or stick, can be easily lubricated and made to run smoothly.
The Q-Plus Core Locking Compound, in convenient 8oz tubes with applicator and full instructions, are available from all good distributors **NOW.**

Q-PLUS ALIGNMENT TOOLS

TYPE Q-PLUS AT1 ALIGNMENT TOOL

An extremely versatile tool with hexagonal end and screwdriver end.
This tool is designed for the new "hexagonal" hole, and screw slot threaded iron cores.

2/8 each



TYPE Q-PLUS AT3 ALIGNMENT TOOL

This tool is specially made for alignment of TV Turret Tuners. The extra long shaft (15in) permits access to even the most "inaccessible" tuners.
Both the Q-Plus AT1 and AT3 Alignment Tools are moulded from a special grade of toughened nylon which makes the tools extremely flexible and practically unbreakable.

4/- each

NOW! THE FIRST RELEASE OF "Q-PLUS"

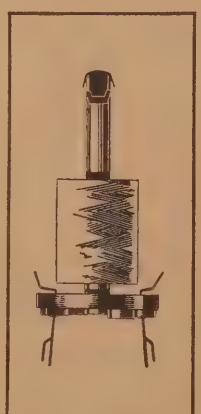
HORIZONTAL OSCILLATOR, WIDTH, LINEARITY COILS & TRANSFORMERS

THE Q-PLUS HO1 HORIZONTAL BLOCKING OSC. COIL

An unshielded line blocking Oscillator transformer recommended for "Synchro-Guide" or similar circuits (e.g. R.T. and H. 17in TV receiver, May '57) "clip-in" mounting, base lug terminations and threaded iron core with hexagonal hole.

THE Q-PLUS HS2 HORIZONTAL SINE WAVE COIL

An unshielded line sine wave coil recommended for use with Type HO1 line blocking oscillator transformer, to improve stability of the line oscillator. Also suitable for "ringing" coil for line multivibrator circuits, features "clip-in" mounting, base lug terminations and threaded iron core with hexagonal hole.



THE Q-PLUS WO1 HORIZONTAL WIDTH COIL

An unshielded line width coil recommended for the adjustment of picture width by means of a variable inductor (width coil) across a small part of the horizontal output transformer (Type Q+ HOPI) e.g. R.T. and H. 17in TV May '57, features "clip-in" mounting, base lug terminations and threaded iron core with hexagonal hole.

THE Q-PLUS LO1 HORIZONTAL LINEARITY COIL

An unshielded line linearity coil recommended for the adjustment of picture horizontal linearity by means of a variable inductor (linearity coil) in series with the damper diode anode and HT+, e.g. R.T. and H. 17in TV, May '57. Features "clip-in" mounting, base lug terminations and threaded iron core with hexagonal hole.

MANUFACTURED BY

R. W. STEANE & Co. Pty. Ltd., Auburn, Vic.

RESISTANCE/CAPACITY COUPLING

One of the circuits we seem to accept without question these days is the coupling between successive audio amplifier stages. Actually there is quite a deal to it and the full significance of component values is well worth understanding if you are to get the best from your amplifiers and receivers.

IN 90 per cent. of cases, coupling between stages is made with a resistance capacitance network. An alternating voltage is developed across the plate load resistor of a valve due to the alternating component of the valve's plate current. This voltage is required at the grid of the following valve.

The grid of the following valve can, and sometimes is, connected directly to the plate of the driving stage but this makes it difficult to provide the correct grid bias. To get over the problem a capacitor is placed between the two circuits with the result that the alternating voltage only is transferred.

The average grid voltage, or bias, of the following valve must be controlled without appreciably disturbing the alternating voltage and this is usually done by connecting a high value resistor between the grid and some other point which determines the bias voltage

The value of each one of the components mentioned has a bearing on the operation of the amplifier

PLATE LOAD VALUE

Take the plate load resistor first. The value assigned to this resistor affects the gain of the stage, its frequency response and the maximum output voltage it can deliver. Distortion is tied up with the plate load resistor value and the final choice may be a compromise between conflicting factors.

A very high value will give high gain but the high frequency response will be limited. This is due to the fact that there is always a stray capacitance effectively in parallel with the resistor. It is made up of the output capacitance of the driver valve, the input capacity of the following valve and stray capacity from coupling capacitor to ground.

As the frequency is raised, the reactance of the capacitor becomes lower until finally it is equal in value to the resistance. At this frequency the amplification will only be about 70 per cent of the amplification at low frequencies

In ordinary audio frequency amplifiers about the highest plate load resistor generally used is 0.25 megohm although where high gain is more important than extended frequency response, 0.5 or even 1.0 megohm may be used.

Lower values are needed when it is desired to extend the frequency response, values such as 0.1 megohm or 0.047 megohm being used in audio frequency amplifiers. Video amplifiers may require the load to be reduced to a few thousand ohms in order to keep the amplification constant at the upper end of the range.

With low values of load resistor, both the gain and the maximum output voltage are reduced.

Gain can be increased by using a valve with a high mutual conductance but there is a practical limit to this because of the difficulty in making a compact, economical and reliable valve. The result is that, very often, more stages are needed for a wide band amplifier

Maximum output can be increased by increasing the plate current of the valve but this involves a larger valve and a more expensive power supply.

In extreme cases, it is necessary to become involved in all sorts of complications with peaking circuits in order to get the required performance at reasonable cost but even then there are limits to what can be achieved.

The coupling capacitor has an important bearing on the performance of the amplifier. If it is large physically, it can have a significant capacitance to a metal chassis and prejudice the high frequency performance but, in general, it mainly affects the low frequency response.

In conjunction with the grid return resistor, this capacitor forms a divider network, in which only the voltage developed across the resistor is applied to the following valve. Therefore, if the reactance of the capacitor is high compared with the value of the resistor, the voltage at the grid is reduced

Large capacitors with adequate voltage rating are expensive and therefore the aim of the designer is always to make the grid return resistor of the following valve as large as possible in order that the capacitor value can be reduced

The upper limit for the resistor depends on the valve and its operating conditions In many cases 0.5 megohm is the largest value that can safely be used but in special cases even up to 10 megohms is suitable.

LF RESPONSE

While the plate load resistor and the previous valve do have some effect on the low frequency response, in most cases it is reasonably accurate to say that the low frequency response varies in proportion to the values of the capacitor and grid return resistor

This being true, the value of the capacitor can be reduced by a factor of 20 when the grid resistor is increased from 0.5 to 10 megohms for the same frequency response.

With ordinary audio amplifiers, values of the order of 0.05 uF and 0.1 uF are frequently used where the grid return resistors are about 0.5 megohm while 0.005 may be adequate to give equal performance when 5 and 10 megohm grid return resistors are permissible.

If you are keen on figures you can work out some examples for yourself. The amplification drops to 70 per cent. of that at middle frequencies approx. the frequency at which the reactance of the coupling capacitor equals the value of the grid return resistor

METAL UTILITY CABINETS

T V

R. and H. type TV chassis with two brackets cadmium plated **£2/13/-**, weight 3½lb

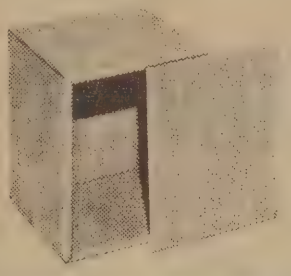
R. and H. type E.H.1. unit box and metal parts to fit above chassis cadmium plated **£1/1/6**, weight 1lb 10oz **Both above units £3/12/6.**

R. and H. type TV tuner chassis brass punched ready for assembly **19/6.**

Mullard type preamplifier cases A or B **£1/6/-**, weight 1lb 10oz.

R. and H. type Playmaster universal type: **£1/6/-**, weight 2lb

All the above plus 25 per cent. Sales Tax



NEW INSTRUMENT CASES

Finished in Grey or Gold Hammer colour with removable lid or back or both. Welded corners Lid turnover or straight

MC5A. R. and H. type with louvres at each end. 9 x 6 5/8 x 5½ deep **18/9**

MC82A. R. and H. type with louvres at each end 13 x 8 x 6 7/8 deep **£1/12/3.**

MC87A with louvres at each end 15 x 10 x 8 deep **£2/2/-.**

Oscilloscope R. and H. type with chassis and all metal work. Internal fittings in grey colour **£15/19/6.**

Oscilloscope. R. and H. type front panel engraved **19/6 each.**

Oscilloscope. R. and H. type with all chassis blank **£8/10/-.**

Oscilloscope. Standard type black chassis, **£8/10/-.**

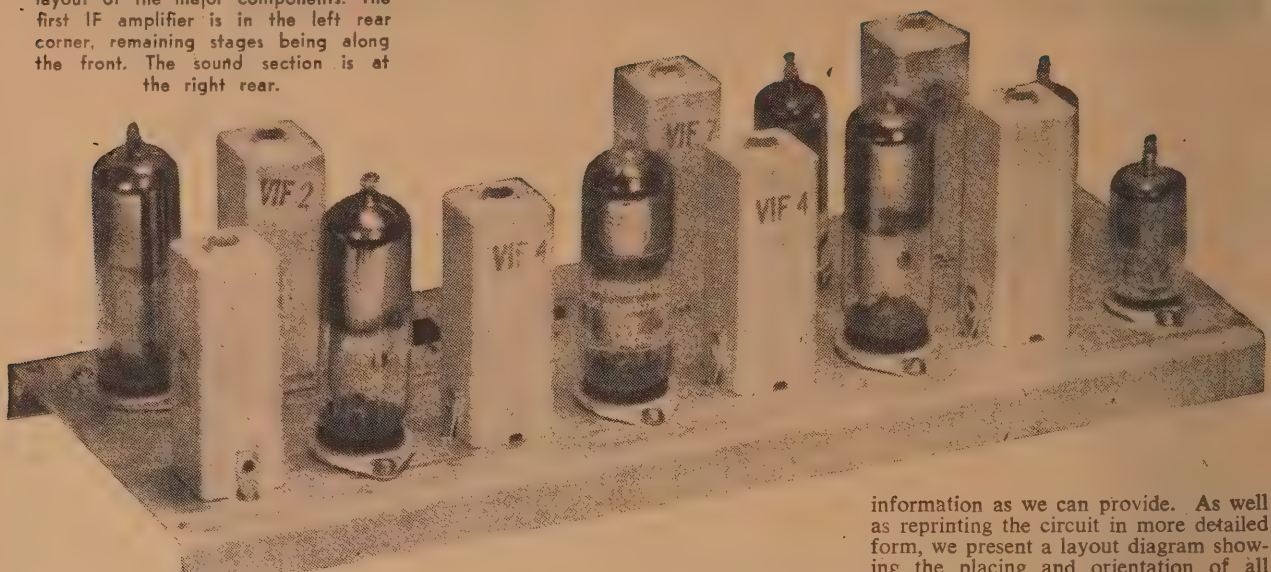
All the above plus 12½ per cent. Sales Tax.

R. H. Oxford & Son

PTY. LTD.

97 Marriott St., Redfern

MX 3764



The complete IF strip, showing the layout of the major components. The first IF amplifier is in the left rear corner, remaining stages being along the front. The sound section is at the right rear.

How To Build Your Own IF Strip for TV

Here is a detailed description of how to build a first class television IF strip around a set of commercial coils. For those who are keen to do this job themselves, but have hesitated due to lack of essential data, this article should provide the answer. Performance of the finished strip is extremely good.

by Philip Watson

WHEN we launched our 17in T.V. receiver in the May issue, we based our description on the assumption that most beginners would be content to purchase a ready-made, pre-aligned IF strip. It seemed to be the most satisfactory solution — at least initially — to the problem of alignment, etc., and we doubted whether many enthusiasts would be in a position to tackle this job themselves.

As it has turned out, the reverse appears to be the case, at least as many constructors being prepared to do the job themselves rather than buy the ready-made variety.

SEVERAL REASONS

There are several reasons for this. An obvious one is the purely financial aspect, since it is possible to save something like £7 by "rolling your own" —even assuming that you buy everything brand new — and this is a worthwhile economy for anyone's purse.

Another is the fact that at least one kit supplier is offering an alignment service for his own customers, thus overcoming a major problem for most enthusiasts.

And, finally, there is always the straight-out desire to make these things for ourselves, simply for the fun and experience of doing it. It's the kind of urge which makes the radio hobbyist "tick" any way and one which has received a terrific boost with the advent of T.V.

The only information published to date was the circuit which we included in the complete T.V. receiver circuit, plus an alignment pamphlet issued by the coil manufacturers. As a result, home builders still had to solve the problems of layout and wiring, and we received many requests that we publish such information.

Here, then, is the story of the construction of such a strip, with as much information as we can provide. As well as reprinting the circuit in more detailed form, we present a layout diagram showing the placing and orientation of all components, an underchassis photograph, and step-by-step alignment instructions and waveforms.

The strip is built around the "Q-Plus" kit of coils and follows the circuit and layout recommended by the makers. We make no apology for specifying a particular brand in a case like this, since it would be very unwise to substitute other coils, probably intended for quite different circuitry, for use with the present arrangement. Conversely, there would seem to be little point in using any but the maker's circuit if these coils are to be used.

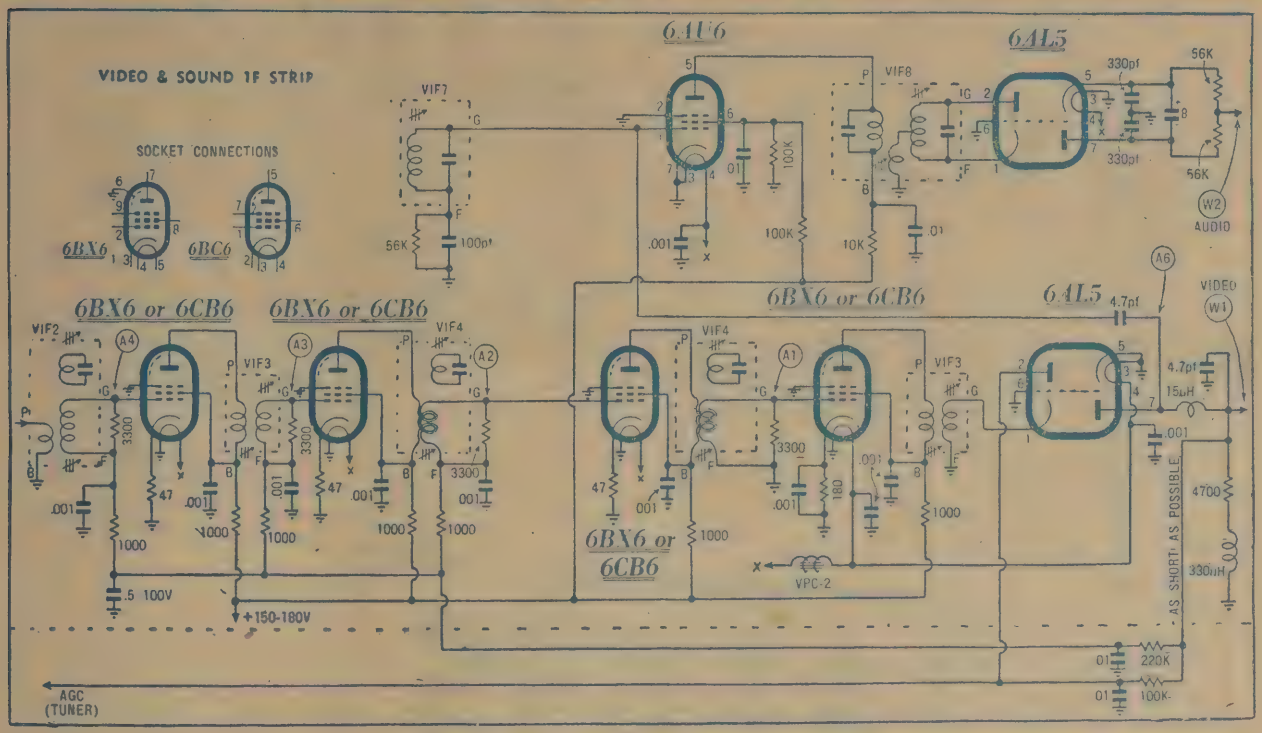
Also, we have deliberately avoided making any major changes in the layout. While it is always easy to suggest alternative arrangements, the point is that the present layout works, and works particularly well. Since changes would only cause confusion without serving any useful purpose there seemed to be little point in making them.

CIRCUIT DETAILS

As can be seen from the circuit, seven valves are used altogether. The video amplifiers are either 6CB6s or 6BX6s, while the sound IF amplifier-limiter is a 6AU6. Two 6AL5s are used, one as the sound ratio detector, the other as the video amplifier, AGC and tuner AGC clamp. Apart from the sockets and socket connections there are no changes required for either the 6CB6s or the 6BX6s.

There are five video amplifier transformers, being a type VIF2, two VIF3s and two VIF4s. The VIF2 has a single tuned link winding, and a trap coil. The VIF3s are double tuned overcoupled bandpass types with adjustments in the primary and secondary windings in the usual way. The VIF4s are single tuned bifilar windings with a trap circuit. Loading resistors are used across various

CIRCUIT IS SIMPLER THAN MANY RADIO DESIGNS



The circuit is no more complex than that of a conventional radio. Note the Alignment and Waveform numbers and that the adjustable iron cores are shown in the correct relative positions. Circuit is identical for either 6BX6's or 6CB6's.

windings to control their bandwidth and "Q."

These circuits combine, when correctly adjusted, to give an overall response curve which can be brought very close to the theoretical ideal. We will have more to say about the actual alignment process a little later on.

There are two sound IF windings, types VIF7 and VIF8. The VIF7 is a single grid winding used in the input circuit and the VIF8 is a conventional ratio detector transformer. Both are tuned to 5.5 Mcs. When these are correctly adjusted they provide the normal band-pass and discriminator "S" curve as required for the FM sound system.

CONSTRUCTION

Coming to the actual construction, there are several approaches which may be considered. You may buy a packaged kit—"complete to the last nut and bolt"; you may buy a ready-made chassis and the major components separately and make use of whatever you have in the way of resistors and capacitors; or you can make your own chassis and buy whatever other parts you need.

A completely packaged kit has much to recommend it, since it saves much valuable time trying to track down components which your dealer always seems to be "missing" just when you most need them. The total cost is generally about the same as the cost of the individual components and may actually work out cheaper when you take other factors into consideration.

On the other hand, those fellows who have a goodly stock of minor components on hand will naturally feel inclined to purchase only larger items, such as coils and valves and, possibly, the chassis. A natural extension of this idea is to cut your own chassis, and there is no reason why anyone handy with tools should not do so. It is a simple chassis—little more than a plate really—and we will have blueprints available for those who require them.

However, there is an important point to watch in the above suggestion. The various by-pass capacitors used in the strip are rather critical and it would be very unwise to use odd paper types from the junk box, even assuming that they test 100 per cent. for both capacitance and leakage.

The fact is that even brand new conventional paper capacitors are not recommended for such applications, the inductance they possess making their by-pass capabilities extremely doubtful. The best choice appears to be the miniature ceramic types, with the metalised paper types a good second choice. In fact, the latter were used in our own strip, as well as many others we know of, and have worked quite satisfactorily

ASSEMBLY

Having obtained your parts, commence by assembling the valve sockets and coils, taking particular care to preserve correct orientation. Reference to the layout diagram will clarify this point. If you decide to use 6CB6's the changes required will not be great, the main point being to retain the approximate positions for the various grid and plate pins.

PARTS LIST

1 chassis 10⅜in. x 4in. x ½in.
4 6BX6's or
4 6CB6's
1 6AU6
2 6AL5's
7 unshielded valve sockets. Suit above valves.

COILS

1 VIF2
2 VIF3's
2 VIF4's
1 VIF7
1 VIF8
1 VPC-2
1 VPC-15
1 VPC-330

RESISTORS

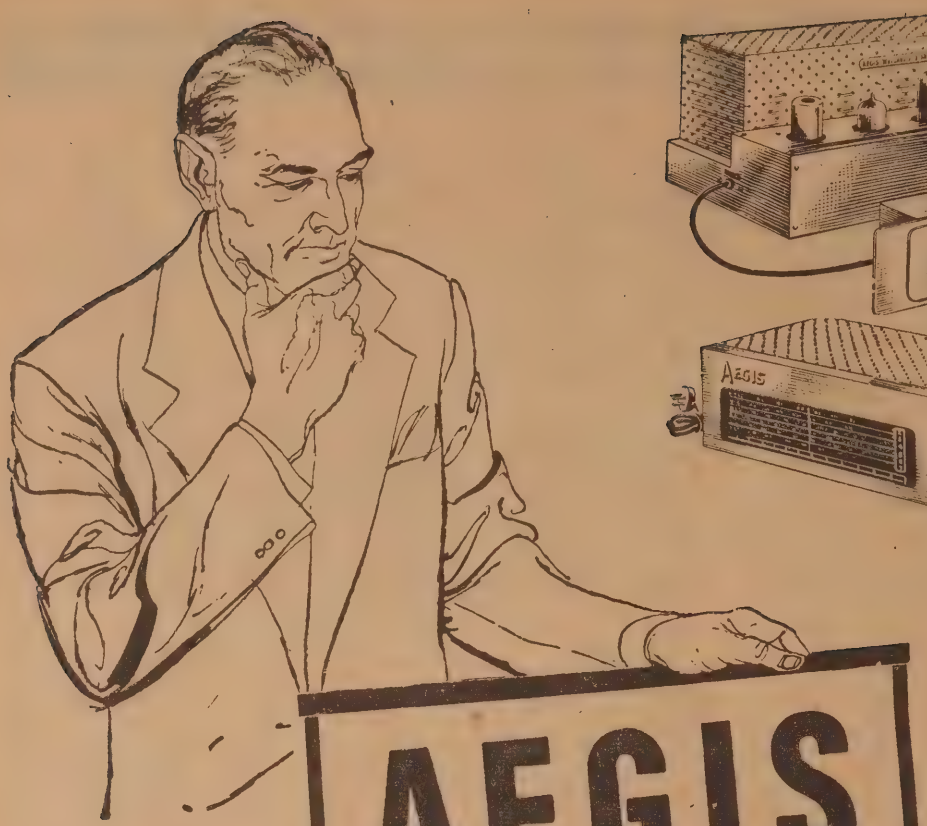
All ½ W type
2 .1 meg.
3 .056 meg.
7 1000 ohm
1 180 ohm
3 47 ohm
1 .01 meg.
1 4700 ohm
4 3300 ohm
External to strip
1 .22 meg.
1 .1 meg.

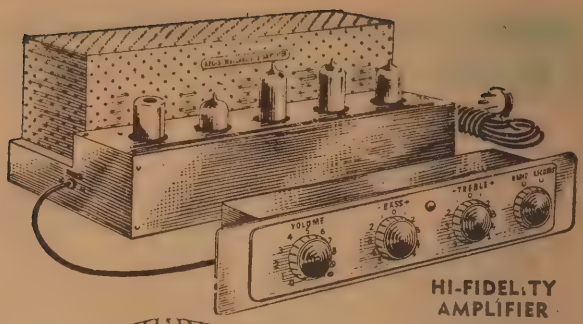
CAPACITORS

1 8 mfd 100v electrolytic
1 .5 mfd 100v paper
All following ceramic or metalised paper types
2 .01 mfd 400v
11 .001 mfd 400v
2 330 pf
1 100 pf
2 4.7 pf
External to strip
2 .01 mfd 200v

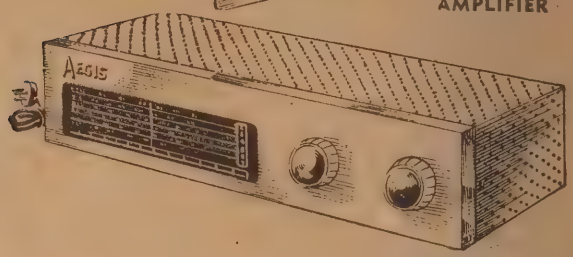
MISCELLANEOUS

1 5 tag terminal strip
3 3 tag terminal strip
2 2 tag terminal strip
18g tinned copper wire, hook-up wire, co-axial cable, nuts and bolts, solder lugs, etc.





HI-FIDELITY AMPLIFIER



HI-FIDELITY TUNER

AEGIS

AUSTRALIA'S OWN BRAND OF HIGH-FIDELITY EQUIPMENT!

Aegis Radio, T.V. and Hi-Fidelity components are backed by continuous research for greater reliability and service. Each is assembled under the supervision of a skilled operator and tested at several points along the production line. Every production step is rigidly controlled! This painstaking care is what gives a high "IQ"—INBUILT QUALITY—to Aegis products.

NOW AVAILABLE!

THE NEW MIGHTY MIDGET AEGIS COILS & INTERMEDIATES

Coils retail at 18/- ea
I.F at 25/- ea

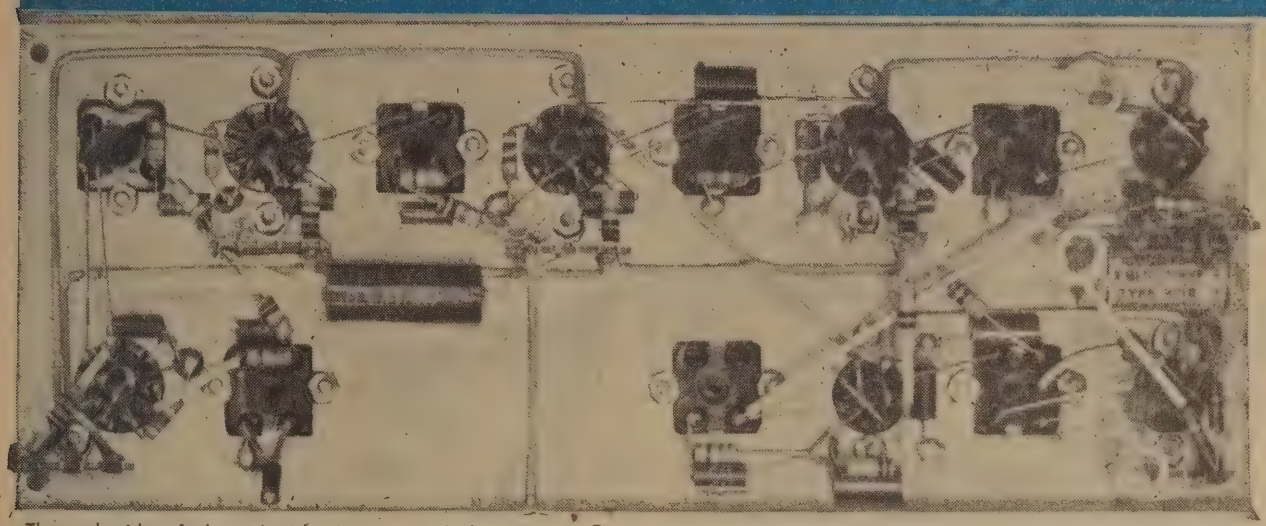
AEGIS Mullard "5-10" HIGH-FIDELITY AMPLIFIER (featured at the top of this page) has been designed to suit Australian conditions. Rated power output 10W Max. 12-13W Frequency response plus or minus 0.5 db, 10 c/s to 20,000 c/s. Alternative impedances available. Amplifier 11¼in x 6½in. Control Panel: 12in x 3in x 1¾in It retails at **£59** Write for leaflet

AEGIS HIGH-FIDELITY TUNER (also illustrated above) combines newest circuit techniques and miniaturisation of components. I.F. Stage has band width nearly double that of ordinary receivers This feature combined with any good treble boost of an amplifier (preferably the AEGIS Mullard "5-10") will give the desired response from broadcasting stations. Finished in permanent SATIN-GOLD finish Retails at **£35**. Write for leaflet

AEGIS MFG. CO. PTY. LTD., 208 LITTLE LONSDALE STREET, MELBOURNE.

TELEPHONE: FB3731. ASK AT YOUR DEALER'S FOR PRODUCTS BEARING THE AEGIS BRAND

UNDERCHASSIS PHOTOGRAPH AND LAYOUT DIAGRAM



The underside of the strip, showing most of the wiring. Compare this with the layout diagram below. The first IF transformer (VIF2) is at lower left, with the remainder of the run along the top. Sound section is at lower right.

Watch particularly that the seven tag terminal strip mounted near the video detector does not project beyond the edge of the chassis, otherwise it will foul the main chassis when the strip is mounted. Some ready punched chassis have this hole somewhat out of place and it may be necessary to drill a new one or, if the error is slight, give the supporting tag a slight twist between the foot and the insulating strip.

Note that some of the AGC components are mounted outside the strip on the main chassis, but are shown in this circuit for the sake of completeness. Also, the lead from the video detector to this external tag strip should be kept as short as possible. The external components are shown outside the dotted border surrounding the strip diagram.

WIRING

Having completed the assembly we can think about the wiring, and this is as good a time as any to say a few words about, and make a plea for, neatness and all round good workmanship We are prompted to do so by one or two recent examples—involving our TV Receiver—and which were certainly not calculated to inspire confidence in the performance of the finished job.

There may be those who argue that beauty is only skin deep and that it is the accuracy of the connections which is all that matters, but there is more to it than that. Quite apart from the personal satisfaction of a job well done there are several practical advantages to making a neat job.

For one thing, long straggling leads and component pigtails which have not been trimmed or straightened, generally mean that some vital leads are longer than they should be and the result is a foregone conclusion.

Secondly, there is no doubt that a neat and logically laid out chassis is ever so much easier to check and service than an untidy conglomeration of parts which look as though they have been thrown into place.

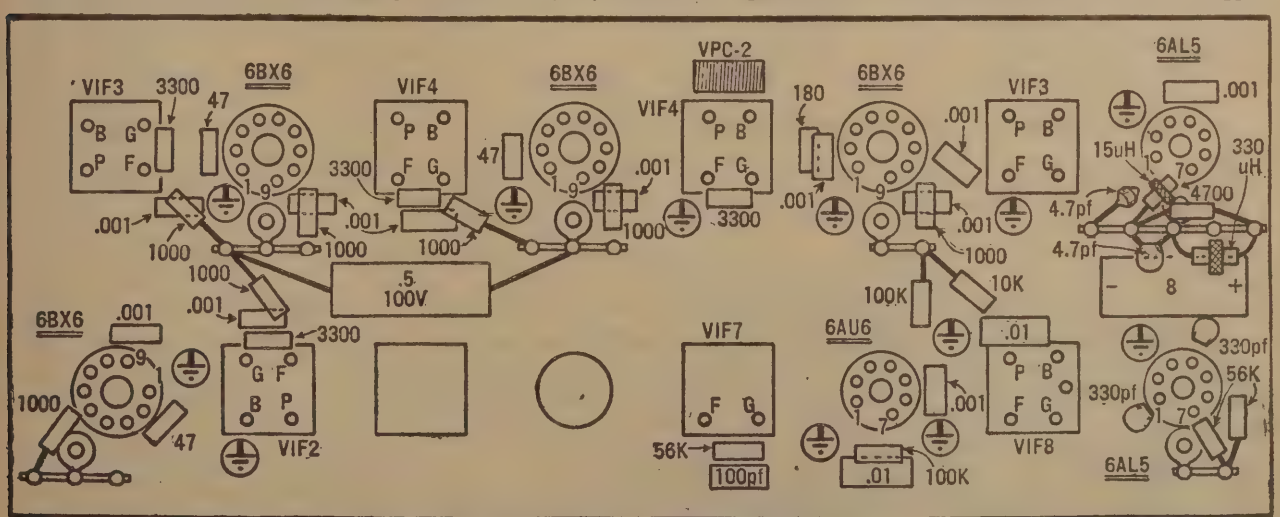
Even more important is the fact that you will probably have to submit your efforts to a professional organisation for final test and alignment. These people reserve the right—quite understandably—to reject any unit which does not look as though it has a reasonable chance of working.

KNOCK IT BACK

Even if they do accept a job which is bordering on the "rats' nest" variety, they are unlikely to spend any time on it if it does give trouble — regardless of whether the trouble is due to wiring, components, or anything else. They will probably advise that the unit be taken home and rewired properly.

The layout shown in the diagram and photograph is such that all important leads are short and clear of other leads, and all earth returns are made to logical points. If you follow it with reasonable care you should have no need to apologise for the final result.

In actual fact, the unit does not appear to be particularly critical, and we have seen versions in which considerably more wiring liberties were taken than in our version, and which appar-



This layout diagram shows the placement and orientation of all components. Note also the earth points which are logical and convenient. Reference to this and the photograph above should solve most layout problems.

Homecrafts PTY LTD

RADIO IS OUR BUSINESS

FB3711

290 LONSDALE ST.

MELBOURNE C1

TRADE ALSO SUPPLIED

Ring FB 3711 For Details

OPEN SAT. MORNINGS

HOMECRAFTS Present THE CAPITOL!

ONE VALVE RADIO KIT-SET

Complete with batteries and headphones.

£6/19/6

LESS HEADPHONES £5/19/6

"CAPITOL"

4 Valve, 6 Watt AMPLIFIER

Featuring separate microphone and pickup inputs. Tone control. Housed in attractive metal cabinet.

19 Gns.

TEST EQUIPMENT

KLEMPT
V.T.V.M. MODEL 200.

COSSOR
SWEEP AND MARKER GENERATOR MODEL B23A
3-inch C.R.O.

TAYLOR
WIDE RANGE R.C. OSCILLATOR, MODEL 191A.

PALEC
M32 MULTIMETER
MX32 "
MX47 "
VCT/3 VALVE AND CIRCUIT TESTER,
ET4A VALVE CHECKER.

UNIVERSITY
MVA/2 MULTIMETER.
YOA OSCILLATOR.
TVR/C3 3-inch C.R.O.
TVR/C5 5-inch C.R.O.
MKI MULTIMETER KIT.
OKI OSCILLATOR KIT.

RECORDING TAPE

	per reel
B.A.S.F. 1200 ft TAPE	67/6
B.A.S.F. 1800 ft TAPE	95/6
B.A.S.F. 600 ft TAPE	39/6
PHILIPS 1800 ft L.P. TAPE	95/6
WESTINGHOUSE 1200 ft TAPE	70/-

TAPE SPECIALS

	per reel
600 ft 6in REEL—WELL KNOWN BRANDS	22/6
1200 ft 7in REEL	45/-
1200 ft 7in REEL PAPER BACKED	27/6

SPECIALS for This Month Only

Sapphire Needles, straight shank, **3/6 ea.**
Standard magnetic, pickup lightweight .. .. **39/6 ea.**
Battery Chargers, 6 or 12 volts, 3 amp. .. .. **99/6 ea.**
230 volt A.C./110 volt D.C. 100-watt inverter .. .. **19 Gns.**
13in x 7in x 2½in Alum. Chassis, **12/ ea.**
Recessed Knobs, in various colours, **3/ doz.**
16-drawer Cabinets, slightly shop soiled .. .. **35/ ea.**
Good quality speaker silk normally 17/6 yd .. .. Now **15/6 yd**
Electrolytic Adaptors .. .. **1/ doz.**
OSL/50 Dials .. .. **35/ ea.**
Dual concentric Speaker, well-known brand **£9/9/**
12in Bass Speaker, well-known brand, **£10/10/**
Disappearing Top Cowl Aerials, **£6**

VISIT HOMECRAFT HI-FI CENTRE AND INSPECT THE BEST IN HI-FI EQUIPMENT

INCLUDING—LEAK—QUAD AMPLIFIERS—BAKER—WHARFEDALE SPEAKERS

Preserve your microgroove recordings by fitting a diamond stylus.

HOMECRAFT'S *FAST* DESPATCH SERVICE

YOUR ORDER IS ASSEMBLED BY EXPERTS AND RUSHED TO YOU

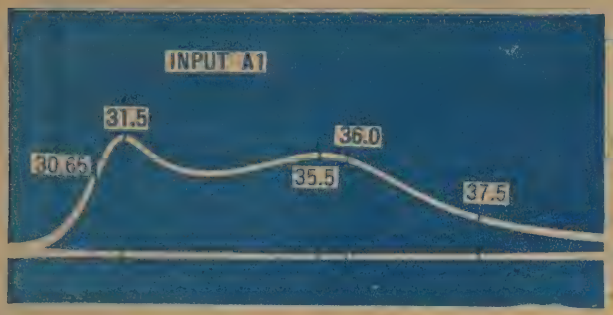


Figure 1. Adjust last VIF3 for double hump.

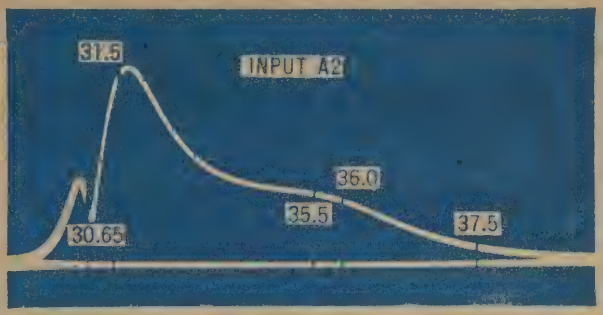


Figure 2. Set 2nd VIF4 trap to 30.65 Mcs., bifilar to approximately 31.5 Mcs.

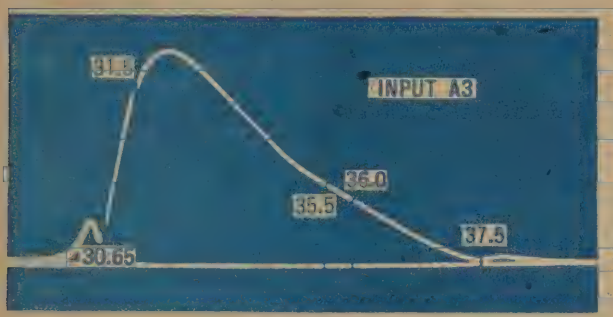


Figure 3. Set 1st VIF4 trap to 37.5 Mcs., bifilar to give above waveform.

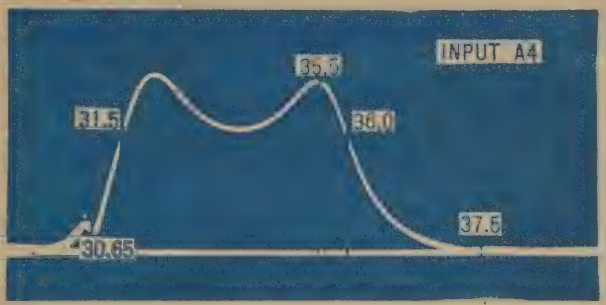


Figure 4. Adjust 1st VIF3 to double hump response as shown. Check marker points carefully.

ently worked quite satisfactorily. At the same time there does not seem to be any point in taking unnecessary risks.

Most of the short wiring is done with 18g. tinned copper wire which has been straightened first by stretching gently. Wiring is point to point, without any fancy bends, particularly on grid and plate leads. Insulating sleeving is not necessary in most cases, but one or two leads run close enough to justify insulation These can be seen in the photograph.

These connections, plus those using the pigtails of resistors and capacitors, will complete the greater part of the wiring. The remainder, mainly filament, HT, and AGC, may be run in conventional plastic hook-up wire. Note that the filament circuit uses only a single line, the remaining pin being earthed at each socket.

FILAMENT BY-PASSES

One point about the circuit which may appear puzzling at first concerns the by-passing of the filament line. As shown there are two by-passes which appear to connect to the same part of the filament line. One is from the 6AL5 video detector and the other from the 6BX6 or 6CB6 immediately preceding it. Although we did not find it necessary the makers recommend that these two points on the filament line be by-passed right at the respective sockets. The original circuit accompanying the coils may not agree with ours, and is apparently incorrect.

If you use a steel chassis we strongly recommend that the various earth points indicated be made by soldering direct to the chassis. This will call for a larger iron than the usual variety, say 100 watts or more, or one of the low voltage quick heating variety, but it would seem to be worthwhile to try to borrow something suitable if it is not already available.

Fairly early in the piece — not later than the completion of the assembly — these earth points should be established in preparation for the wiring. Using the layout diagram as a guide, deposit a small blob of solder at each point indicated. The commercial "passivated" finish takes solder quite readily and no preliminary cleaning or special fluxes will be necessary.

LOGICAL POSITIONS

Once these points are established it becomes fairly easy to connect the various component pigtails to them, though a heavy duty iron will still be necessary. While on this same subject we should point out that the position of the earth points does not appear to be particularly critical. We have selected them as being the most logical arrangement, in both the physical and electrical sense, but we have seen less logical arrangements which apparently worked just as well.

In fact, we have had the opportunity of checking with one organisation who have wired a large number of these strips, as well as a number of individuals who have made their own, and we have had no reports of instability or anything approaching it. (We are discounting a couple of cases where faulty screen by-passes were encountered.) In short, the design appears to be an inherently stable one.

In the event that an aluminium chassis is employed it would be quite satisfactory to provide the usual earth lugs under existing or specially located mounting bolts.

In mounting the actual components there are a few points worth noting. Some brands of resistors at present available, while perfectly satisfactory in all other respects, are not self-insulated as are some other types. As a result, shorts may occur if they are allowed to rest against the chassis or adjacent bare wiring. Provided this point is appreciated, it is not a serious disadvantage in this type of resistor.

CAPACITOR PROBLEMS

Similarly, the small metallised paper capacitors may present problems to those who have not handled them before. Particularly where very short leads are required, it is sometimes difficult to effect a good soldered joint and, at the same time, avoid damaging the outer case of the component with the heat involved.

Most of the trouble is due to heat being conducted through the pigtail to the body of the component and is best controlled by gripping the pigtail between

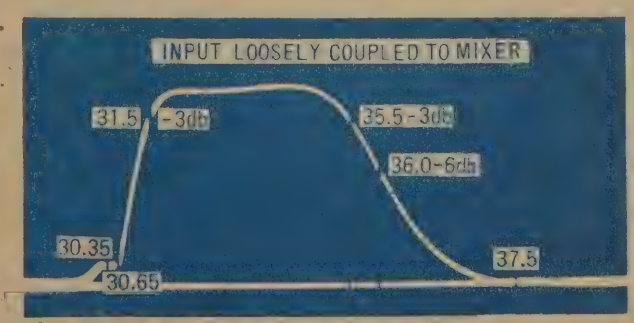


Figure 5. Here is the final response curve, the VIF2 and coupling coil in the tuner, being adjusted to fill in the trough between the humps. The trap is set to 30.35 to complete the sound plateau. Note that this picture was taken before those reproduced above.

AUSTRALIA'S HIGH FIDELITY CENTRE

at AUDIO ENGINEERS PTY. LTD.

NEW STOCKS

Goodmans "Sherwood" speaker enclosures. Several finishes to choose from. Designed to suit—**Axiom 150-22 Audiom 60-70.**

Facilities for Fitting of **Goodmans Trebax Tweeter**

Price for Enclosure **£31/15/-**

Price for A.R.U. **£6/7/6**

CALL AT OUR SHOWROOM TO SEE AND HEAR THESE UNITS.

NEW EQUIPMENT

Available now! The new Hi-Fi "Grampian" model MA5-10B Amplifier and Tone Control unit. Specially designed for Crystal Pick Up use. Ultra linear 5V amplifier; Tone Control complete with Bass-Treble control LP and STD. record equalisation. **Plug in** pick up equaliser.

Price only £51/9/- tax incl.

EASY TERMS AVAILABLE METROPOLITAN AREA ONLY

NEW STOCKS

ORTOFON

The World's Finest Pick-up

12in arm type SK212	9 18 3
16in arm type RK309	24 7 11
Pick-up Head type "B"	33 5 0
Pick-up Head type "C"	37 19 9
Matching transformer 251	5 9 4
Adaptor for BJ Super 90 and standard arms	1 16 6

NOTE: Heads complete with diamond Styli.

NEW EQUIPMENT

Now Available .. ..

The latest "DUAL" model 1005 4 speed automatic record player. An excellent companion to the new "Grampian" model MA5-10B Amplifier Unit.

Price £37/9/6

Also suitable is the new "dual' model 295 4 speed player. **Priced at £18/10/-.**

STOCKS OF PRE-RECORDED TAPES NOW AVAILABLE - Stereosonic & Single Track

STOCKTAKING SPECIALS

SLIGHTLY MARKED OR DEMONSTRATION MODELS

1. Bell and Howell 16 MM Projector complete with Screen transformer. Spare Lamp and 3 packs film **£285/15/5** Plus Tax 12½ per cent. if applicable.
2. Simon model SP2 tape recorder **£185.**
3. Quad FM tuner **£49/10/-.**
4. Thorens E53 NPA motor and turntable **£28/15/-.**
5. AU12 RJ type enclosures. **£19/10/-.**
6. BJ Super 90 PU arm. **£21.**
7. Thorens CD438 Auto changer. **£49/15/-**
8. Thorens CBA83P auto player, **£25/10/-.**
9. Chapman S5E wide range tuner. **£35/11/5.**
10. Chapman FM81 FM tuner. **£35/8/10.**
11. Record storage cabinet. **£3/15/-.**

POSITIONS VACANT

Audio Engineers require RADIO ENGINEER to take charge of factory, a JUNIOR SALESMAN and a SENIOR SALESMAN for Showroom. Enquiries received at address below.

VISIT OUR SHOWROOMS

"MECCA OF THE ENTHUSIAST"

422-424 KENT STREET, SYDNEY

Fidelity AE Audio Engineers PTY. LTD.

PHONE BX 6731

the jaws of your long-nosed pliers. Although not always appreciated, the same procedure is desirable for resistors, which can change their value if subjected to too much heat.

Apart from the foregoing points it is only necessary to exercise reasonable care and the normal standards of good wiring practice in order to duplicate the original version.

When the wiring is completed it should be visually checked as thoroughly as possible and, if convenient, it may be given a rough voltage check. This consists of feeding the unit with appropriate heater and HT voltage and checking that all heaters function and that voltage is present on all plate and screen pins.

Though a relatively elementary check, it may reveal one of those "silly" mistakes which can waste a lot of time when the alignment procedure is commenced—an important item if you're paying for someone else's time.

ALIGNMENT

If the unit appears to pass this examination satisfactorily we are ready for the actual alignment process. It should be appreciated right from the start that it is virtually impossible to align a strip of this nature without the aid of a sweep generator, CRO, and associated equipment. Therefore, if you do not possess such equipment, pass it over to someone who does and do not be tempted to fiddle with the adjustments yourself or align it with an ordinary generator. While you may not do any harm, you won't do any good either; but merely waste a lot of time.

However, for the benefit of those who have access to such equipment we will detail the steps necessary for this particular strip. It is assumed that the user is familiar with the operation of sweep generators in general and reasonably conversant with his own equipment. We will concentrate on points peculiar to this strip.

To facilitate rapid and positive identification of the various test points, we have labelled the circuit with "A" (Alignment) numbers where the generator is to be fed in and "W" (Waveform) numbers where the CRO is to be connected. We have also shown the coil cores in their correct relative positions, i.e., all primaries or bifilar windings as bottom cores, and all secondaries or traps as top cores.

We have also reproduced a series of photographs, taken directly from the screen of the C.R.O., of the wave forms obtained from the various test points in our own strip. Note particularly the final result, which is extremely good, and probably unlikely to be bettered anywhere. As far as we can see, there is no reason why the home builder should not approach this very closely

WAVEFORM GUIDES

At the same time, we would emphasise that the waveforms displayed should be regarded as a guide only. Due to inevitable variations in layout, valve characteristics, and even the coils themselves, there is no guarantee that the best overall response will automatically result from achieving each individual waveform, or even that these waveforms can be exactly duplicated.

In all cases the final wavetorm is the main criterion, assuming that it is achieved without seriously prejudicing the overall gain. If, therefore, having followed the sequence we are about to describe, the final result is not optimum, a little intelligent "fiddling" with the various cores is quite permissible. In fact, it is quite surprising the degree of improvement obtainable by moving a couple of cores half a turn or so.

It must also be appreciated that the strip cannot be considered as a completely separate item, the response curve being affected to an appreciable extent by the characteristics of the tuner to which it is connected. Ideally, therefore, the final alignment should be made only when the strip and tuner are mounted in the main chassis and permanently coupled together.

CALIBRATING THE CRO

During the actual alignment process it is necessary to refer constantly to various check points on the response curve, it being customary to set the marker generator to each point in turn as required. This can be a tedious and time-consuming process, as it may be necessary to check as many as five points on each response curve before passing on to the next one.

It is also extremely easy to be misled by the general shape of the curve, resulting in a curve which looks right but which fails to measure up to specifications when the marker points are set up. This may mean scrapping a complete set of adjustments for the whole strip and going back to "scratch."

In the absence of a multiple marker generator (as used industrially), the next best approach appears to be that of calibrating the face of the C.R.O. It is generally possible to make a useful mark on the glass face with a pencil, though some types of crayon may be better. Provided care is taken not to touch the relevant controls afterwards, these can be used throughout the alignment process.

Mainly to preserve the marks in our photographs, we resorted to another trick. Using some stretched 26g tinned copper wire, we fastened a series of vertical rods to the front of the C.R.O. face, holding them in place with sticky tape. They appear in the photographs as small breaks in the trace and are easily identified

MARKER FREQUENCIES

The major marker points are as follows: 37.5 Mcs, the adjacent channel sound frequency; 36 Mcs, the picture carrier frequency and which should be 6db from the top of the response curve (approximately half-way down the slope in practice); 35.5 Mcs, the "3db down" point just after the roll off from the top; 31.5 Mcs, in this case the 3db down point at the other end of the response; 30.65 Mcs, the first trap for the sound plateau; and 30.35, the second trap for the sound plateau. Check these points on the accompanying photographs.

We would once again emphasise that the correct shape of the curve can only be judged by constant reference to the appropriate markers. Non-linearity in the sweep circuit, an unduly compressed or expanded image, and other factors, can all combine to produce an image which looks good even though it is bad, or one which looks bad even though it is correct.

Another pitfall is overload. This causes the top of the response curve to flatten off in a manner which may lead the uninitiated to imagine that he has produced a perfect curve! It is a good idea to establish just where this occurs by advancing the gain and restricting the pattern height of the CRO. A point will be found where the top of the response seems to strike an invisible barrier, flattens off, and will go no further. This is the condition to avoid.

Allied to this is the question of bias. For various reasons it is not possible to make full use of the AGC bias during alignment, and this must be provided artificially. A 4.5-volt torch battery connected between the AGC line (negative) and the chassis is the most effective way of doing this.

After all these preliminaries have been taken care of, the actual alignment can be commenced. The CRO is connected to the video output (WI) using a .047 meg resistor in series to minimise RF in the CRO lead and possible regeneration.

FIRST STEP

The sweep generator is fed into point A1 and the primary of the last IF adjusted to produce a peak at 31.5 Mcs. The secondary should now be set to 35.5, producing the double hump response shown in Figure 1. If it should transpire that it is difficult to place these two humps far enough apart—as it was in our case—it will be necessary to provide some additional coupling between primary and secondary.

This is done by connecting a small amount of capacitance between the grid and plate pins of the coil, a short length of twin plastic lighting flex being a very convenient way of providing it. Start with about an inch of flex and separate just enough to reach the two coil pins, leaving the remainder standing upright.

This will probably be a trifle too much "C," pushing the humps too far apart. If so, clip about 1/16in from the flex and try again, repeating the procedure until the desired result is obtained.

Be most careful to see that all cores peak in their outermost positions. If peaked on the inner position, the close physical relationship between them will cause spurious and unwanted coupling between the windings.

Now to input point A2, reducing the generator gain if necessary. First set the trap circuit to 30.65 Mcs. Trap circuits produce a marked dip in the response which can be "walked" across the response curve to the desired point. Setting this one correctly is the first step in producing the sound plateau.

SECOND STEP

Now tune the bifilar winding to 35.5 Mcs., producing the lopsided response as in figure 2. Check that this does not upset the trap circuit, and readjust if necessary.

With the sweep connected to input point A3, there is another trap to be set, this time at 37.5 Mcs. It is not easy to set the bifilar winding to a specific frequency, it being more useful in effecting minor changes in the general shape of response (see figure 3). However, it can be used to control the height of the sound peak and, ultimately, the plateau.

This value is fairly important, and is recommended as 5 per cent. of the maximum height of the curve. If it is appreciably less than this it is possible that the sound level may be inadequate; while, if greater, it can cause frame buzz in the sound.

This is due to the basic fact that, when two signals are mixed in a non-linear device, the resultant beat (the 5.5 Mcs. sound IF in this case) will favour the modulation contained in the weaker of the two. In this case we require the frequency modulation of the sound-carrier, so we keep its level weak relative to the picture-carrier.

The input point A4 brings us to another double-tuned IF. Once again we require a double hump effect, though this time it must be deliberately unbalanced to favour the 35.5 Mcs. region. However, it is still important that the humps be adequately spaced and it will probably be necessary to overcouple it in the same manner as the other VIF3. The result should be as in figure 4.

TUNER ADJUSTMENTS

At this stage we need to have the tuner in operation and, ideally, both tuner and IF strip mounted in the main chassis. Test point A5 is a very loose coupling to the mixer valve—in our case a scrap of sheet copper bent to form a shield which was a neat fit over the glass envelope. The regular shield is removed, the new one fitted—taking care not to earth it—and the generator lead clipped to it.

The last trap (VIF2) should now be adjusted to 30.35 Mcs., though a little juggling is permissible to produce a reasonably flat plateau. The height of the plateau should also be checked at this point and, if it appears incorrect, it may be necessary to go back to the A2 or A3 inputs and modify the height of this peak accordingly. Since this will modify the remainder of the response curve, the remaining steps should be checked again and corrected as required.

Assuming the plateau is correct, the tuned winding of the VIF2 coil and the coupling coil in the tuner should now be adjusted. This combination normally produces a single hump response which is very useful to "fill in" the dip in the middle of the response as evident in figure 4.

If the "Q" of these circuits is too low there will be insufficient amplitude to achieve this, while if too high, it will tend to round the top of the response. In the case of the R.T. & H. tuners it will usually be necessary to load the tuner coupling coil with about 2,200 ohms, but this can easily be modified if necessary.

The final result should be as in figure 5, or very close to it. The fact that we have been able to achieve this curve on two consecutive strips (July, page 79) suggests that others should behave similarly. It is therefore well worth striving for.

THE SOUND SECTION

Adjustment of the sound section can be accomplished in several ways. It may be done with the sweep generator and CRO, using 5.5 Mcs. crystal to set the centre of the "S" curve accurately or, using the same signal source, a DC voltmeter may be substituted for the CRO. Thirdly, a station signal can be used in conjunction with the DC voltmeter. This latter arrangement has the advantage of greatest accuracy.

If using your own signal source, this should be fed in at point A6 to avoid loading the VIF7 winding. The waveform or DC voltage is taken from point W2.

When using a voltmeter, the procedure is deliberately to unbalance the secondary of VIF8 (it probably will be unbalanced, anyway), thus giving a meter reading indicative of the adjustment of the other windings. These—VIF7 and the primary of VIF8—are adjusted for maximum output.

The secondary of VIF8 is then adjusted for zero output, the zero of the meter being checked to ensure accurate adjustment. In most cases this will result in settings which tally very closely with those obtained on the CRO.

SEALING THE CORES

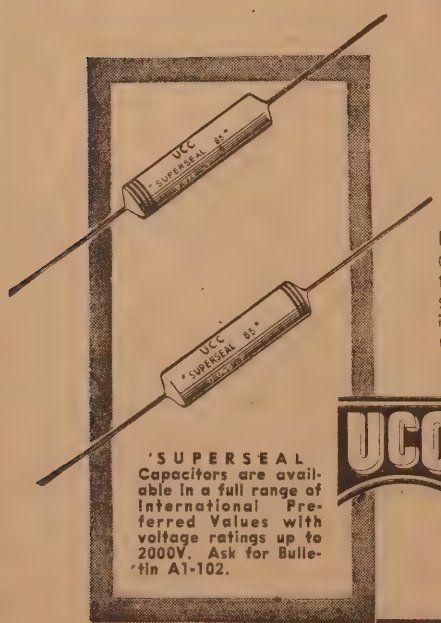
Finally, having achieved correct adjustment of the cores, there comes the question of sealing them to prevent mechanical drift. There are many schemes and a number have been discussed in recent Argument articles. Most fail in one respect or another, and we would like to see a better approach to the problem by coil manufacturers.

In the meantime, we have a personal preference for the use of a strip of rubber between the core and the former. A section of thin rubber band—the thinner the better—is simply fed into the former and the core screwed in after it. It will make the core tight, but still capable of smooth adjustment. This idea is used extensively in commercial sets, and its only apparent disadvantage is that the rubber will ultimately perish, probably locking the core too securely.

IT'S NOT THE HEAT, IT'S...

it makes no difference, if it's a

"SUPERSEAL" CAPACITOR



'SUPERSEAL Capacitors are available in a full range of International Preferred Values with voltage ratings up to 2000V. Ask for Bulletin A1-102.

Designed to withstand the most severe conditions of humidity and high temperature operation, the UCC "Superseal" range of paper tubular capacitors is ideally suited to high-quality radio, television and electronic equipment. Thermo-setting Polyester end seals ensure an extremely high degree of protection against moisture penetration and allow an upper temperature limit of + 85° C. to be achieved without voltage derating. For the utmost in reliability, always specify UCC "SUPERSEAL" 85.

UCC

UNITED CAPACITOR CO. PTY. LIMITED
433 Punchbowl Road, Enfield, N.S.W.

YB 0311

MELBOURNE: U.C.C. Pty. Ltd., 486 Bourke Street.
ADELAIDE: Stephen & Co., 83 Grenfell Street.
BRISBANE: Tecnico Ltd., 103 Albert Street.
PERTH: O. F. Gamble, 384 Murray Street.
N.Z.: H. W. Clarke (N.Z.) Ltd., 42 Cable Street, Wellington.
TAS.: G. A. W. Wood, 46 Brisbane Street, Launceston.

Here's your answer, Tom!

We feel that Tom is going to be very versatile when he grows up judging from the variety of questions submitted. Television seems to be foremost in every one's thinking today and appropriately Tom's initial queries are based on this subject.

Is it illegal to use an autodyne converter as a TV turret tuner? If so, could one use an R.F. amplifier ahead to prevent any radiated signals?

It is not so much a question of legality, Tom, as (a) what is considered to be good practice and, (b) a consideration of one's neighbours. This last, for example, is the main reason why we have discouraged the use of superregenerative circuits in the past. They also have radiation problems. An autodyne tuner is probably quite practical in a TV turret tuner but we would suggest an R.F. stage, to give the neighbours a "fair go" and also to improve the performance of the tuner as a whole.

★ ★ ★

Would it be possible to use a neon tube oscillator as a line oscillator (or frame oscillator) and, if so, could it be synchronised by a coil of wire around the tube connected to the synchronisation circuit?

We cannot speak from practical experience, Tom, but neon oscillators have never been noted for their stability nor for their ease of synchronisation. Consequently we feel that, by the time you have overcome these difficulties, you will have at least as many components as in a standard valve circuit, with probably poorer performance.

★ ★ ★

Could you please tell me how to interpret valve code letters and numbers?

The American system of valve coding has become "saturated" with the variety of valves, but it was based on the following idea: The first figure in the code indicates the heater voltage, with slight differences, so that 1 stands for 1.5 and 2 volts, 2 stands for 2.5 volts, 6 or 7 for 6.3 volts, and so on.

The second figure denotes the number of electrodes in the valve, the metal shell or metallising being counted as one electrode and the heater as another.

Intervening letters differentiate between different types of valves. Since all the letters of the alphabet have been used, some valve codes use two intervening letters.

Final letters, on some valve types, are used to indicate other types of envelope or other special features. For example, "G" denotes a standard glass envelope and "G.T." denotes a small tubular envelope.

Early Continental valve manufacturers tended to use their own system of coding so that, at one stage, there were as many separate codes as there were manufacturers. Some moves were made to standardise the code and most of the valves that have reached the Australian market conform to this standardised European code.

This system is too lengthy to detail on this page and one of these days we may devote a short article to it.

But really, Tom, system or no system, there is no substitute for valve charts or valve books which list the things you really want to know about a valve.

★ ★ ★

What does an Ampere-hour mean and how is it connected with batteries?

An Ampere-hour is a practical measure of quantity of electricity and is the amount of electricity delivered when a current of one ampere flows for one hour. Other combinations of current and time may also give the same product, such as 2 amps. flowing for half an hour, etc.

"Sandy never bothered to watch TV until we got caught for a licence!"

Accumulator cells are commonly rated by their Ampere-hour capacity, which is a number giving the current which can be supplied by the cell for a certain time. The Ampere-hour capacity is obtained by multiplying the discharge current in amps by the duration of current flow in hours and, at the end of the time specified by the Ampere-hour capacity, the cell may be considered to be discharged.

In some cases, cells may also carry a maximum discharge rating, which sets a limit to the load current which can be imposed on the cell.

The same general factors operate when re-charging a cell, namely, the maximum permissible charge rate and the total number of ampere-hours making up the charge.

Since no battery is 100 p.c. efficient, more ampere-hours are expended in charging the cell than it is capable of delivering, but, basically, it may be considered that a 50 ampere-hour cell may be recharged by passing 5 amps through it for 10 hours, and so on.

In the case of dry cells, any ampere-hour rating is rather ambiguous because the quantity of electrical energy varies a good deal with the order of the load current imposed on it. Rather than rate their dry cells in terms of ampere-hours, manufacturers are more happy to suggest the life in hours of their cells for different orders of load current and different periods of operation.

★ ★ ★

How do crystal pickups, microphones and loudspeakers function?

These devices, Tom, depend for their action on the piezo-electric effect of certain crystalline substances. Rochelle salt exhibits this effect to a greater degree than any other crystal, and is the most widely used.

When a suitably cut slice of Rochelle salt is placed between two conducting plates, it will expand or contract when potentials are applied between the plates. Conversely, when subjected to mechanical stress the crystal can be made to produce a voltage.

If slices of such crystal are cemented together, the assembly being known as a "bimorph," the combination will twist or bend markedly when potentials are applied between the plates. Conversely, significant potentials will be generated if the bimorph is subjected to mechanical stress.

In the simplest crystal microphone, a diaphragm transmits these stresses to the bimorph. In a better quality microphone a combination of two bimorphs is used to make a cell. Multi-cell combinations, to form a single unit, are also used.

The crystal pickup operates on a similar principle, the stylus being so attached as to cause mechanical stresses to the crystal plates, in sympathy with the groove variations.

A crystal loudspeaker operates in the reverse manner to the microphone.

The QUAD II is a RELATIVELY PERFECT Instrument

In like manner, enthusiasts the world over are expressing their approval of the QUAD II Amplifier—whereas we don't go so far to say the QUAD II is perfect, we do claim that it is the best which present techniques can devise The Design of the QUAD II is simple and straightforward, without the sacrifice of a single refinement capable of contributing to the final objective.

Here is a brief summary of the main features:—

- ★ 4 input sockets each selected by push buttons covering connection to microphone and radio (or two radios), tape recorder and gramophone.
- ★ 1 outlet socket for taking off a signal suitable for recording, permanently in circuit.
- ★ 2 power supply sockets for supplying radio units also switched by the same push buttons that select the signal inputs.
- ★ A versatile system of pickup matching which can be extended to cover new developments in pickup design as well as covering all models now on the market.
- ★ Facilities for providing alternative playback characteristics for different makes of record.
- ★ A minimum of controls yet providing independent balance of bass and treble, quite apart from the comprehensive filter arrangements so well proved in the past.
- ★ Alternative output impedances from the Main Amplifier
- ★ All controls, including the mains on/off switch, are incorporated in the Control Unit leaving the Main Amplifier free to be installed out of sight in the cabinet.

Acoustical

QUAD II

AMPLIFIER

FOR THE CLOSEST APPROACH TO THE ORIGINAL SOUND

SOLE AUSTRALIAN AGENTS

BRITISH MERCHANDISING PTY. LTD.

Box 3456 G.P.O. Sydney. Phone BL3954

PRICE'S RADIO

5-6 ANGEL PLACE, SYDNEY

NEW—

The 4th edition of Philips

TRANSISTORS & DIODES

A complete handbook on Transistors, Germanium and Silicon Diodes. Complete technical details and circuits 132 pages.

6/6 post 8d

RCA RECEIVING TUBE MANUAL

352 pages of information on valves, including curves, circuits, etc.

8/- post 9d

RADIO SERVICING

Supplementary Volume

FAULT FINDING

Deals with the practical aspects of fault finding, and is a companion book to Radio Servicing Vol. 1 and Vol. 2 66 pages.

7/6

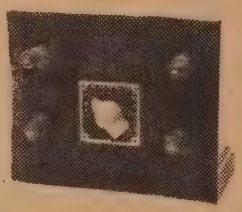
TV SYNC SEPARATORS

Deals with the most important section of the TV receiver. By G Patchett 72 pages.

7/6

BUILD IT YOURSELF

CRYSTAL SET



Complete kit of parts including ready wound coil and instruction sheet. Works well in most districts and can be built in an hour

42/- post 2/-

SENSITIVE IMPORTED HEADPHONES. 4000 ohms Ideal for all small radio sets, etc.

41/-, post 1/-.

MAIL ORDERS

Price's Radio have the largest variety of radio and TV components in Sydney. Your orders will receive prompt and efficient attention

POSTAGE SHOULD BE INCLUDED WITH ORDER

TECHNICAL BOOKS

RADIO SERVICING.
Vol 1. Basic Electrotechnology . . 7/6
Vol. 2. Intermediate Radio Theory . . 7/6
The above volumes are based on the City and Guilds examinations in radio and TV servicing.

RADIO SERVICE INSTRUMENTS
E. N. Bradley. Deals with the construction calibration and use of multimeters signal tracer, oscillators etc. 72 pages. . 6/9

SIMPLE ELECTRONIC MUSICAL INSTRUMENTS
A. J. Douglas. This book describes several different instruments with constructional details. 72 pages 7/6

MAGNETIC RECORDING.
M. L. Quartermaine. General theory and full construction details for wire and tape recording. 72 pages 6/9

RADIOTRON TV.
Full details of Radiotron TV valves and special components 3/

RADIO CONTROL.
For model ships, boats and aircraft + C Judd Basic principles. Components Transmitters Receivers Frequency meters Full construction details 140 pages . . 12/6

RADIO CONTROL OF MODELS.
G Sommerhoff. Practical book on the construction of simple control systems 70 pages 7/6

PRACTICAL TV AERIAL MANUAL.
R. Laidlaw Describes almost every type of TV aerial with details of construction and erection 80 pages 7/6

TELEVISION TIMEBASE CIRCUITS.
C. H. Banthorpe. Describes most timebase circuits and how they operate 64 pages 7/6

SUPPRESSING INTERFERENCE.
Radio and Television B. L. Morley Describes various types of interference and how to eliminate it 64 pages 7/6

The above books are post free.

WRITE FOR COMPLETE BOOK PRICE LIST

FOR THE BEST SELECTION OF RADIO AND TV COMPONENTS

How are spot welding and arc welding accomplished?

Spot welding is a form of resistance welding and consists of passing a suitable current between two metals at the points to be joined. If the current is sufficiently high, the heat generated by the current, passing through at the point of contact, fuses the metals together.

The method generally consists of pressing the metals to be joined between two tapered electrodes. The current is then switched on for a sufficient period to produce the welding temperature.

Arc welding utilises the fact that if two electrodes between which a current is passing, are slowly separated, an arc may form between them through which the current continues to flow. The voltage across the arc increases with the arc length, being about 25 volts per inch in the case of copper electrodes. The number of amperes per unit cross-section of the arc generally varies between 600 and 62,000 amperes per square inch.

In welding, one connection is taken to the work and the other to a movable electrode. The arc is drawn between these two members and the operator can direct the intense heat of the arc to any part of the work by moving the electrode.

The principle of the arc is not limited to welding alone. Smelting furnaces also use this principle and arcs drawn between two carbon electrodes are used as sources of illumination for projectors in theatres.

★ ★ ★

How does a photo-electric cell function?

Certain metals exhibit the property of electron emission when exposed to light. This group of metals, the alkali metals, give a strong photo-electric effect with light corresponding to the visible part of the spectrum. Caesium is one of the most efficient photo-electric emitters and is widely used.

Briefly, the emission photocell consists of two electrodes, the cathode and the anode, within an evacuated or gas-filled envelope. The cathode is either flat or shaped to catch the maximum amount of light, and is coated with a thin film of one or other of the alkali metals. The anode faces the cathode and usually takes the form of a wire loop or similar, so as to obstruct as little as possible the light directed on to the cathode. The anode is made positive with respect to the cathode so as to attract and collect the electrons emitted by the cathode.

The current output of an emission-type photocell is only a few microamperes and considerable amplification is required before any practical use can be made of it. The uses of a photocell are numerous, the best-known example being in sound film projectors.

In other applications, variations in the photocell current, after suitable amplification, are used to trigger relays, etc. This is the principle behind electronic counters, intruder alarms and such like.

★ ★ ★

What is a leaky grid detector?

A leaky grid detector is a detector circuit that combines the functions of a conventional diode detector and of a triode amplifier. All this may be accomplished within a single triode valve.

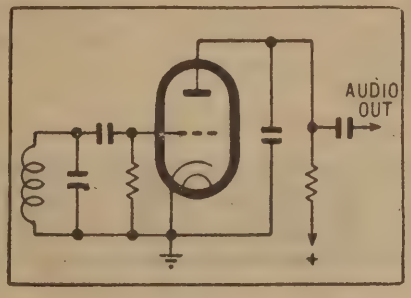
A circuit of the basic unit is reproduced and, refering to this, the action is as follows: In the absence of any signal the grid assumes a potential such that a very small grid current flows. An incoming signal will now cause the grid to become alternately negative and positive. When a positive signal is applied, the grid will momentarily become positive and grid current will flow. In other words, electron flow will take place between cathode and grid.

Under these conditions rectification will take place in the same manner as in the conventional diode, the grid acting as the diode anode.

The function of the grid resistor is to leak away the accumulation of electrons at the grid which would otherwise make the grid permanently negative, due to the positive half cycles, to the point of blocking.

The value of the resistor is chosen so that the electrons may leak away from the grid at a rate commensurate with the slow changes of the audio frequency envelope, but not fast enough to follow the rapid radio frequency changes.

Putting it another way, we could say that the grid circuit of the leaky grid detector is so arranged that the grid will be driven negative in a manner more or less equal to the amplitude variations of the incoming signal. Since these grid voltage variations will cause corresponding variations in the anode current, the triode is also able to function as a voltage amplifier.



Basic circuit of a leaky grid detector discussed here.

The valve will also tend to amplify the radio frequency signal, which we do not require and, to overcome this, a bypass capacitor is connected from plate to cathode. The value chosen is such that it does not affect the higher audio frequencies but acts as a low-impedance bypass to the radio frequencies.

★ ★ ★

What are alkaline cells?

Alkaline cells differ quite radically in construction from the lead-acid type. The electrolyte is a solution of caustic potash or potassium hydroxide in distilled water. The specific gravity of this electrolyte is about 1.19.

Two types of alkaline cells are in use, the nickel-iron cell and the nickel-cadmium cell. In the nickel-iron cell the positive plates contain a nickel hydrate mixture which also contains graphite and other materials, while the negative plates consist of iron oxides.

In the nickel-cadmium cell the positive plates are of a similar material while the negative plates contain a mixture of cadmium and iron oxides.

The chemical action of an alkaline cell is very complicated but broadly, it may be described as the oxidation of the positive plates during charge and the reversal of this process in discharge.

PROVED SUPERIORITY

"BELLING-LEE" VEE-ROD TV AERIALS HAVE THESE OUTSTANDING ADVANTAGES

VASTLY SUPERIOR PERFORMANCE to other Double-V Aerials on every TV Channel—**proved by exacting field tests and polar diagrams.**

EASIEST and FASTEST to erect, 4 complete alternative mountings (wall, chimney, flat roof, inside roof), or arrays available separately.

CORROSION-RESISTANT, EXTRA STRONG, withstanding any climatic conditions. They go straight up and stay up straight. Individually tested; 12 months guarantee.

IMPROVED RECEPTION in weak areas with this Double-V; vertical stacking overcomes excess interference; highest electronic and engineering standards applied by the world's most experienced makers.

TROUBLE-FREE TV builds better business. Send for illustrated technical brochure. Install the best — "BELLING-LEE", available from your Wholesaler.

TV AERIAL SYSTEMS

BELLING-LEE

Sole Australian Agents:

R. H. CUNNINGHAM Pty. Ltd.

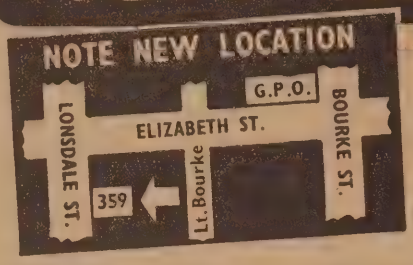
8 BROMHAM PLACE, RICHMOND, VICTORIA

Phone JB 1614

16 ANGAS ST., MEADOWBANK, N.S.W.

Phone WY 3852

NEW WARBURTON FRANKI OPEN MAGNIFICENT NEW SHOWROOMS for



MELBOURNE'S FINEST DISPLAY OF T.V. AERIALS AND ACCESSORIES . . .

Everything for T.V. installation—not only in stock but ALL ON DISPLAY. See the actual fittings erected on dummy walls and roofs. Wherever you look—walls, ceiling or floor—you'll see attractive, informative "Channel Master" displays.

ALL "CHANNEL MASTER" AERIALS FULLY PRE-ASSEMBLED FOR QUICK ECONOMICAL ERECTION

CHANNEL MASTER design engineers were the FIRST to develop the pre-assembled method of construction. All CHANNEL MASTER aerials, including conicals, super-fans and yagi types, reach you completely assembled in individual carton with all elements, reflectors and directors ready to open up and lock into position in a matter of moments. No separate pieces to get lost or waste your valuable time in fitting together. Install CHANNEL MASTER for complete satisfaction.

★ PLUS A COMPLETE RANGE OF ACCESSORIES FOR ALL TYPES OF T.V. AERIAL INSTALLATIONS

CHOOSE FROM THIS OUTSTANDING RANGE OF T.V. AERIALS . . .

Item	Model No.	Retail
Rabbit Ear Indoor Aerial	300	£5 10 0
Showman		£15 10 0
Conical	301	£9 14 6
Dual Flector	310	£10 4 6
Super Fan	313	£11 6 9
Rainbow	330	£21 0 0
Super Rainbow	331	£33 6 9
Challenger 6 Element	626	£13 18 0
Challenger 10 Element	1026	£16 18 0
5 Element High Band Yagi	607/9	£10 0 0
10 Element High Band Yagi	1007/9	£16 9 0
5 Element Low Band Yagi	602	£14 12 0
10 Element Low Band Yagi	1022	£27 19 6
Travelling Wave		
7 Element	350	£42 15 0
5 Element	351	£32 10 6
3 Element	352	£22 18 6

WORLD-FAMOUS EQUIPMENT — W.F. for HI-FI — TO GIVE TOP-CLASS PERFORMANCE

● LOUDSPEAKERS

Wharfedale 12/CS/AL £44 3 7
Wharfedale 8/CS/AL £13 12 4
Wharfedale W12/CS £28 1 9
Wharfedale Super 3 £13 12 4
Baker 15in Auditorium £39 3 11
Grampion 1255/15 £20 6 3
Kelly Ribbon Tweeter £30 9 5
Leak "duad" Dual Concentric £53 12 6

● AMPLIFIERS

Leak TL12—£121 16 0 · Leak TL10—£74 11 0

● PICK-UPS

Leak Pick-Up (with LP head and fitted with diamond stylus), £23 18 4.

IMPORTANT ***Limited stocks of all the above equipment are available ex-stock at Warburton Franki's High Fidelity Department.***

● TRANSCRIPTION MOTORS

Thorens E53 NPA.
High Fidelity Record Players and Record Changers—£35 1 10.
Thorens CBA83N—Auto Player—£50 15 5.
Thorens CD43N—Record Changers—£69 11 0.

SPECIAL OFFER *Thorens CB 33PS Manual Players*

These players are new, but have been recently superseded by a new model. **£30**

NOTE All Thorens record players and changers are fitted with General Electric Variable reluctance cartridge.

WARBURTON FRANKI (MELB.) LTD.

359 LONSDALE ST., MELBOURNE — PHONE MU 9664

TRADE ALSO SUPPLIED

PLEASE INCLUDE POSTAGE OR FREIGHT WITH ALL ORDERS

"CHANNEL MASTER" AERIALS and ACCESSORIES
ALL RADIO and TELEVISION PARTS . . .

★ EVERYTHING FOR RADIO AND T.V. CONSTRUCTION AND SERVICE

See us for all your needs—if we haven't got what you want we'll get it for you quickly and at no extra cost.

Famous DUAL Players & Changers

New 4-speed Changer—Model 1005, £37/9/6 (Freight Forward).
The Model 295 4-speed Player £18/10/- (Freight Vic. 3/8, Int. 6/-).
Monarch UA8 Record Changers 4-speed, £20/10/-. (Freight Forward)
B.S.R. HF8 Record Player 4-speed with Crystal Head, £13/5/- (Freight Vic. 3/8, Int. 6/-).
or with Variable Reluctance Head, £16/5/- (Freight Vic. 3/8, Int. 6/-).

New C.E. 4-speed GRAMO-MOTOR

Featuring a Solid Cast Turntable — available either with Synchronous Motor at £32/10/- or non-Synchronous Motor at £28/10/6. (Freight Forward.)

PICK-UPS

(suitable for use with the above or other Motors). Acos HGP40 complete with 2 Heads at £9/15/- (Freight Vic. 1/10, Int. 3/-). Goldring L56/555 Variable Reluctance at £13/10/- (Freight Vic. 1/10, Int. 3/-).

MAGNIFICENT "MAGNAVOX" SPEAKERS

HI-FI SPEAKERS

MODEL	HF5	6WR	8WR	12WR
Overall Diameter	5¼"	6¾"	8-3/16"	12¼"
Baffle Opening	4-13/16"	5-9/16"	7-1/8"	11"
Voice Coil Diameter	¾"	1"	1"	1"
Voice Coil Impedance	2.7 ohms	2.7 ohms	2.7 ohms	2.7 ohms
Cone Resonance	130-C.P.S.	45-C.P.S.	45-C.P.S.	45-C.P.S.
Frequency Range	130-10K	30-15K	30-15K	40-15K
Power Handling Capacity	4 watts	6 watts	7 watts	10 watts
Retail Price	55/11	£6/10/-	£7/-/-	£7/9/4
Freight Vic.	1/6	1/10	1/10	2/3
Freight Int.	2/6	3/-	3/-	3/8

★ *REPLACEMENT CONE HEADS ARE AVAILABLE FOR ALL MAGNAVOX SPEAKERS*

Remember also that Warburton Franki stock all well-known Speakers such as Rola, Jensen, Peerless, etc.

TV COMPONENTS

HERE ARE JUST A FEW OF OUR STOCK LINES

- Q-Plus Video Peaking Coils—2/8 plus Tax. (Freight: Vic., 3d. Int., 3d.)
- Q-Plus Video and Sound I.F. Strip—19 gns. Plus Tax. (Freight: Vic., 1/10. Int., 3/-.)
- Q-Plus V.I.F. Kit comprising 7 V.I.F. Transformers and full circuit and instructions. Price—98/-. plus Tax. (Freight: Vic., 1/6. Int., 2/6.)
- R.C.S. Combined Video and Sound I.F. Strip Unwired. Chassis, Coils and Diagram. Price 115/- plus Tax. (Freight: Vic., 1/6. Int., 2/6.)
- R.C.S. Incremental Tuner — Price 77/1, plus Tax. (Freight: Vic., 1/6. Int., 2/6.)
- R.C.S. Frame Output Transformer 6BM8, 33/4, plus Tax. (Freight: Vic., 1/10. Int., 3/.)
- R.C.S. Filter Choke 3H 300mA—20/, plus Tax. (Freight: Vic., 1/10. Int., 3/.)
- FERROCART Turret Tuner 10 Channel—£14/13/, plus Tax. (Freight: Vic., 2/3. Int., 3/8.)
- FERROCART Chassis and Tube Mounting Hardware £6/12/, plus Tax. (Freight forward.)
- FERROCART Mask Assembly—20/8, plus Tax. (Freight: Vic., 1/6. Int., 2/6.)

Write or Call for information about the above components or other required parts.

OPEN SATURDAY MORNINGS

WARBURTON FRANKI (MELB.) LTD.

359 LONSDALE ST., MELBOURNE — PHONE MU 9664

PLEASE INCLUDE POSTAGE OR FREIGHT WITH ALL ORDERS

The cabinet has matching speaker frets, one on either side, covered with gold-finished expanded aluminium.

This is how the R. T. & H. 17-inch Television Receiver will look, when completed and installed in your lounge room. You will have every reason to be pleased with its appearance, its performance and the fact that you have built it yourself for a lot less than an equivalent commercial receiver.

CONCLUSION

ng a novice to attempt anything quite so ambitious as a TV et.

It was our intention, earlier, to follow up the original 7-inch circuit with a modified version containing various possible elaborations. However, having lived with the prototype eceiver for several months and viewed copies of it, we have vised our ideas considerably

In short, success of the original design has been so unqualified that it is hard to justify the inclusion of such elaborations. To release a new, complete circuit containing them would carry the inference — quite unjustly — that the earlier one was in some way inadequate or out of date. Nothing ould be further from the truth

ONE STANDARD CIRCUIT

Another important point is that trade supply houses have organised things around the original design and, to introduce another 17-inch circuit at this stage would only lead to unnecessary confusion and to arguments as to who wants what —and for how much.

We have therefore elected to treat any elaborations as entirely optional, to be adopted or ignored according to personal preference. Any components involved can be arranged for, over and above the one basic kit.

This being so, we have reprinted the full schematic circuit overleaf, essentially in its original form. Apart from anything else, it will provide a second copy for those whose original circuit may by this time have become defaced.

In reprinting the circuit we have taken the opportunity of correcting one or two errors and adding other items of information, most of which have been listed in previous issues.

We have modified the drawing slightly to emphasise the subdivision of the major circuits and added voltage ratings to several capacitors, in line with components which are now available. The IF circuit has been redrawn also, to make it conform in appearance with the circuit elsewhere in the issue.

These are all relatively minor points but they will ensure that you have a circuit available which is as up to date as we can possibly make it.

So much for that. It now remains to comment as necessary on various portions of the circuit, mentioning any relevant points or possible modifications.

Firstly, the pentode tuner, which was originally described in the February, 1957, issue.

WORKS WELL

This unit is still in use with the prototype receiver and is proving quite satisfactory in practice. It provides plenty of signal on all channels in a good average location, has given no trouble due to switch contacts and has proved completely free from frequency drift.

It remains a proposition, therefore, for anyone who can expend the time to build it more readily than the money to buy a commercial unit.

OUR 17-inch TELEVISION SET

Although, last month, we presented the final major article on the R.T.& H. 17-inch TV Receiver we can usefully add a few remarks about circuit elaborations and answer a variety of questions which have been put to us by intending constructors. Elsewhere in the issue, we present a complete article covering the construction and alignment of a suitable IF strip.

OVER twelve months ago, you may recall, we asked the question, "Can a TV set be built in the home?" In the May issue, last, we answered our own question in the affirmative by presenting a complete design for home construction.

Reader response to the project has been nothing short of amazing and, in the intervening weeks, literally hundreds of chassis, transformers and other key components have been sold, indicating as many receivers under construction.

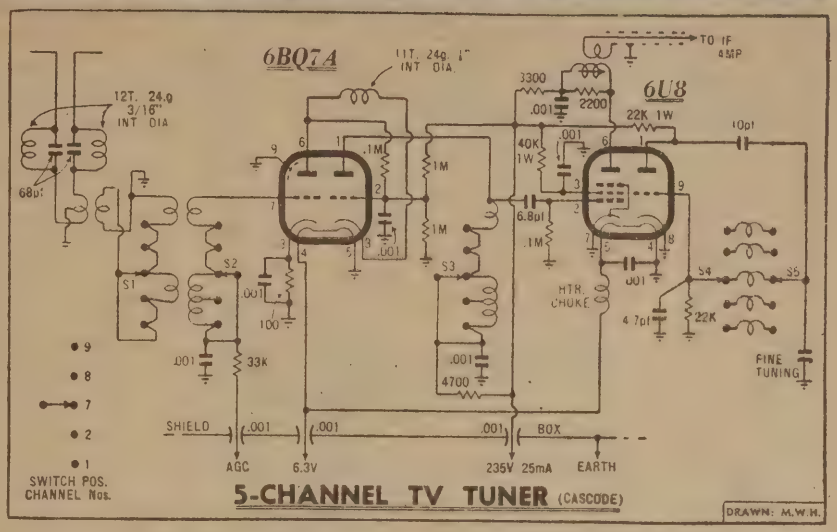
QUICK OFF THE MARK

Even before the second instalment appeared, we had reports from readers who had raced ahead and completed a receiver, working only from the original circuit and photographs. Since then, the number has been growing steadily and the pleasing aspect is that no one seems to have had any special trouble in obtaining excellent pictures and sound. This has been gratifying indeed.

To be sure, the successful constructors have not been novices at the game but experienced home-builders, amateurs, factory technicians and others, who have tackled the project both to save money and to gain experience in the new field.

This is only what we expected and, in fact, home TV construction activities will probably remain centred in this group. Notwithstanding our best efforts with diagrams and photographs, we would hesitate a long time before encourag-

CIRCUIT OF "CASCODE" TV TUNER



Here is the essential circuit information for readers who may want to experiment with a home-constructed cascode tuner. The 33 Mc aerial filter may be useful in areas where medical and industrial heating equipment causes interference on the low channels.

For those who may have missed out on the February issue, a few copies still remain in stock at the time of writing. While the original article gives the essential information necessary to duplicate the tuner, a few additional remarks may be helpful, covering construction and adjustment.

Firstly, you will note that we now show a small IF trap connected in series with the feeder input circuit.

This filter will not be necessary in ordinary suburban locations but may be of value in certain areas, where medical and industrial RF heating equipment is in use. Some of this equipment radiates a damaging amount of signal around 30Mc, which may penetrate to the receiver IF system, particularly when the front-end circuits are tuned to one of the lower frequency channels.

IF FILTER

In such a case the inclusion of a filter centred on the IF band may help matters, though it obviously cannot obviate interference from such sources, due to harmonic radiation on higher frequencies.

The accompanying sketch gives all essential details of the trap. It can best be assembled on a scrap of resistor panel, with the eyelets removed carefully and re-inserted as shown. By means of a small bracket, the trap can be mounted on top of the tuner, in place of the tag-strip originally specified, the feeder wires being connected directly to it.

If wound strictly to specifications, the trap should land somewhere in the IF pass band. However, by checking against a grid-dip oscillator, the coils can readily be knifed to resonate on 33Mc. Each coil will need to be shorted out, while the other is being checked, to avoid ambiguity.

We have heard one or two tuners in which instability has been encountered. In one instance, the instability had more to do with the IF amplifier and the trouble disappeared when the tuner output coil was loaded and the IF channel aligned to give a broad response rather than a single prominence.

In another case, stability appeared to be improved by wiring an extra .001mfd. bypass directly between the 6U8 screen and its own earthed cathode pin. In the same tuner, the 6U8 plate lead was looped up toward the grid feed circuit, instead of being pushed down against the chassis, then out through the hole to the tuned output transformer. This aggravated grid-plate capacitance effects in the 6U8.

LAYOUT, COMPONENTS

At the frequencies involved details of layout can be quite significant, as also the choice of components. Only miniature ceramic capacitors should be used, mica or paper type being unsatisfactory.

The 5-position multi-bank switch is the most difficult and costly item in the tuner and is well worth saving on, if you can get together enough odd (but good) switch banks to serve the purpose.

While we used and specified 5-position switch sections, it would be entirely possible to build a tuner around 3 x 3 banks. They would need to be mounted with a common contact close to the relevant circuit points and the first pin, serving Channel 9, in the same position as shown for the original tuner.

The basic Channel 9 coils would not be affected significantly by the number of other contacts on the switch. In a 3-position wafer Channel 7 would necessarily occupy the adjacent position and hairpin loops, made up from about 1in of braid, would probably be necessary to resonate the incrementally tuned RF grid and plate circuits Channel 2 coils would remain substantially as specified.

Don't forget to wire the switch as indicated, so that unused coils in the aerial, grid and plate circuits are shorted out automatically.

In regard to the coil data, a slight error occurred in the table given for the tuner in the February issue. We stated that all oscillator coils were to be wound to a 1/8th inch internal diameter, whereas those for Channels 1 and 2 should actually be 3-16th inch. Fortunately, most constructors spotted the error, since the size of the coils was fairly evident from the photograph and was also inferred at the end of the article.

by *Neville Williams*

Do not take the coil data for granted, however. While the oscillator coils can be put on to frequency in obvious fashion by squeezing or knifing the turns, extra signal strength can be realised by making sure that the RF grid and plate circuits are properly aligned

Their tuning is broad but nevertheless significant. While the effect of adjustments can be noted on the picture under low signal conditions, measurement of the AGC voltage with a VT voltmeter gives a much more conclusive indication.

In a simple AGC system, the control voltage will vary markedly with tuning and picture content but its general order can be assessed well enough by tuning each time to a specific region just clear of where sound streaks appear in the picture. Alternatively or as well—maximum and minimum AGC voltages for each station may be observed.

For purposes of test, the effective inductance of the coils can be reduced and the resonant frequency raised by slipping a brass bolt into the "cold" end of the coil. Alternatively, the metal tip of an alignment tool, touched on the RF grid or plate pin, will introduce small extra capacitance and lower the resonant frequency.

TRIMMING THE COILS

If reduced inductance raises the signal strength, try opening out the coil or reducing the number of turns. If more capacitance appears to improve matters, squeeze the coil, or increase its diameter or add an extra turn to give the same end-result.

At the frequencies involved, the unused section of the incremental circuit will have some bearing on alignment and final peaking should not be attempted before all coils are in position on the switch, together with the shorting link.

Begin, therefore, by winding all coils to specification, solder them to the switch and then proceed to check alignment in detail.

Check the Channel 9 aerial and RF coils first and peak them, using the methods already suggested.

Then switch to Channel 7. Any inductance variation which seems necessary must now be achieved by lengthening or shortening the links between the Channel 7 and Channel 9 contacts, leaving the basic Channel 9 coils untouched.

To obtain increased inductance, bend the links into a shallow arc and solder between the tips of the switch contacts. To reduce inductance use a direct link and solder between the contacts hard against the switch wafer.

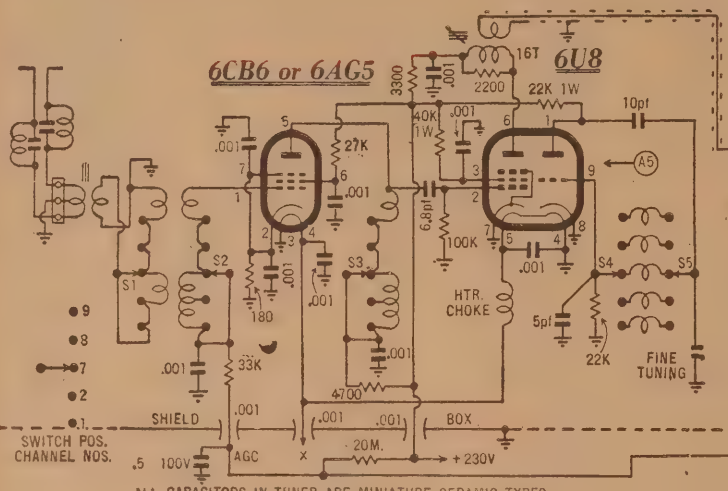
The Channel 2 coils can be peaked

REVISED DIAGRAM OF 17-INCH TV RECEIVER WITH A

TUNER

For full description of 5-Channel tuner see R. T & H. for February 1957. A simple pentode tuner is suitable for good signal areas only. For poor signal areas use a "cascode" RF Amplifier or, for preference, a commercial tuning unit.

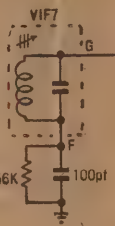
VHF MULTI-CHANNEL TUNER

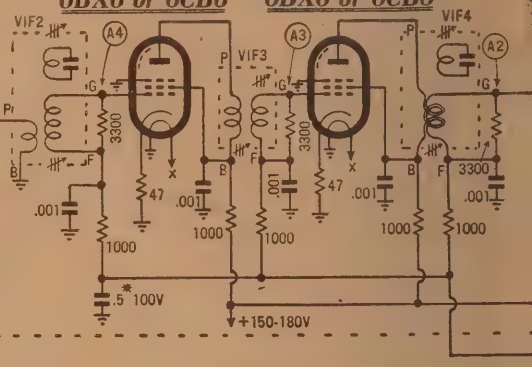


ALL CAPACITORS IN TUNER ARE MINIATURE CERAMIC TYPES

VIDEO & SOUND IF STRIP

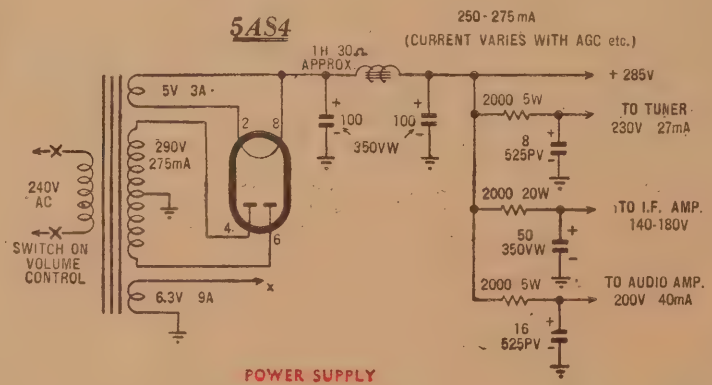
Circuit shown is for a "Q-Plus" prefabricated and pre-aligned IF strip, Mark 1. Mark 2 strip has a second sound stage for use in areas where interference is a particular problem.
If desired, the strip can be home-constructed, using the specified components and layout. (See elsewhere, August, 1957 issue).



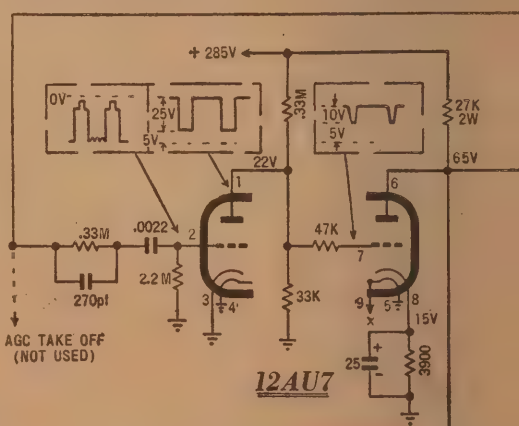


* THESE COMPONENTS ADDED INTERNALLY

POWER SUPPLY



SYNCH. SEP.



NOTES

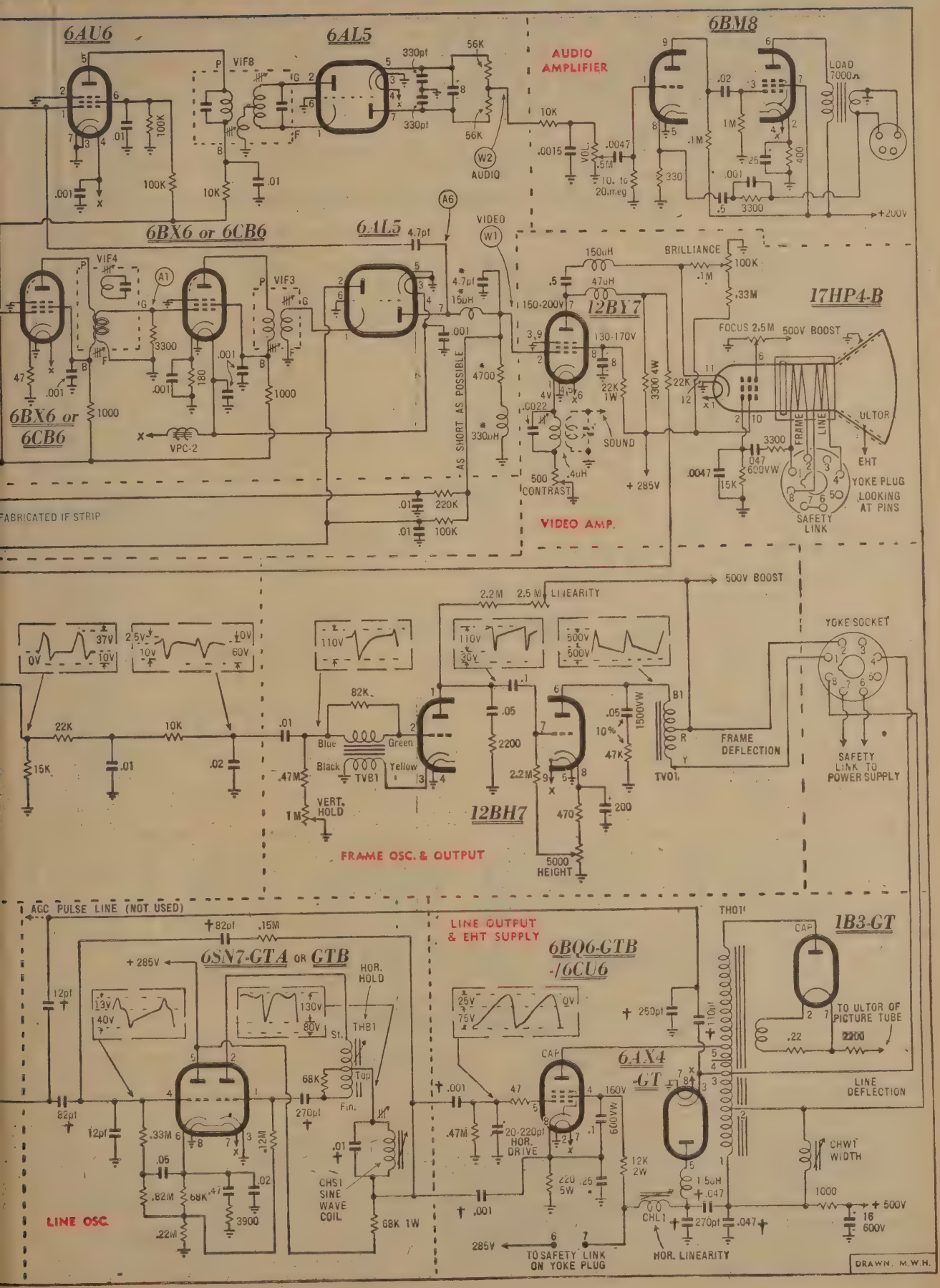
1. ALL CAPACITOR VALUES ARE SHOWN IN MICROFARADS, UNLESS OTHERWISE MARKED.
2. ALL RESISTORS ARE HALF-WATT UNLESS OTHERWISE MARKED.
3. VOLTAGES ARE AS MEASURED IN PROTOTYPE CHASSIS, USING STANDARD TOLERANCE NOT DESIGN CENTRE COMPONENTS.
4. ALL RESISTOR VALUES ARE SHOWN IN OHMS UNLESS OTHERWISE MARKED. (M = MEG. K = x1000)
5. † 1000VW

SOCKET CONNECTIONS

17-INCH TELEVISION RECEIVER

(PENTODE TUNER, SIMPLE AGC.)

IMPORTANT VOLTAGES, VALUES AND WAVEFORMS



HOMECRAFTS

RADIO IS OUR BUSINESS

100 CLARENCE ST., SYDNEY. BX 4451

ALIGNMENT TOOLS

Jabel Double ended 3/-
Q Plus AT1 .. .. 2/3
Q Plus AT3 .. .. 5/-

INVERTERS

Van Ruyten 12TR 12 volt DC 240v A.C. 100 watt Unfiltered. £21/8/-
Van Ruyten 3253FF 32v D.C. 240v A.C. 100 watt fully filtered, £31/17/6

CRYSTAL SETS

Q Plus Crystal Set complete with Headphones and Aerial .. £4/19/6
Q Plus Crystal Set only .. £2/13/6

TEST EQUIPMENT

MULTIMETERS, ELECTRONIC VOLTMETERS, VALVE TESTERS, ETC., MADE BY ADVANCE, PALEC, UNIVERSITY and TAYLOR. CALL AND INSPECT OUR STOCK OR WRITE FOR DETAILS AND PRICE LIST

A. & R. TRANSFORMERS

Ask for your copy of Audio and Power Transformers. Catalogue by A. and R

Available Now ! ROLA 12UX HI-FI

LBI LOUDNESS CONTROL

The automatic compensation of the L21 eliminates the necessity for a tone control.
AVAILABLE in 1 meg. ,500,000 ohms, with or without switch. Other values to special order.
PRICES: With D.P.S.T Switch, 32/6; Without Switch, 26/6.

SCOPE

SOLDERING IRONS 6 sec.

Standard £2/10/-
Instrument £2/10/-
Vibroscope £1/15/-
Transformers £2/7/11

ANTIFERENCE T.V. AERIALS

11 .. .. £7/6/- ea.
111 .. .. £9/9/- ea.
109 .. .. £15/15/- ea.
212 .. .. £11/-/- ea.
215 .. .. £15/10/- ea.
104 .. .. £15/-/- ea.
U2R .. .. £3/15/- ea.
U4H .. .. £6/7/6 ea.
2RE .. .. £4/4/- ea.

CRYSTAL SET BUILDERS

Single Gang Condensers .. 1 guinea
Q-Plus Headphones £2/1/-
Spring Terminals .. .. .. 1/2 ea.
Germanium Diodes
OA70—OA73 .. .. .. 6/1 ea.
OA81—OA85 .. .. .. 7/1 ea.
Jabel Crystal Coil .. .. .. 7/- ea.
Aerial Wire (100ft.) .. .. 14/9 ea.
Insulators .. .. 1/- ea.
Boys' Book of Crystal Sets 3/9 ea.

RECORD PLAYING EQUIPMENT

Collaro 3/554 Record Players, 3-speed. studio "O" Cartridge, £12/15/6

Collaro R.C. 456 Record Changers. 4-speed. studio "O" Cartridge, £22/7/6
B.S.R. HF8 Player £13/5/-

B.S.R. UA8 Record Changers, 4 speed £20/10/-
DUAL 295 Record Players, 4 speed £18/10/-
DUAL 1003 Record Changers, 3 speed £37/9/6

BUILD YOUR OWN T.V.!!

ALL COMPONENT PARTS NOW AVAILABLE AT HOMECRAFTS

TRADE SUPPLIED

HOMECRAFT'S FAST DESPATCH SERVICE

quite readily by knifing and spreading one or both ends to obtain optimum inductance.

One other point about the tuner is that we show a loading resistor across the tuned output coil. Experience with the tuner feeding into various IF channels has shown the desirability of using such a resistor to prevent the output coil from having too much effect on the overall selectivity pattern of the IF channel. A value of 2200 ohms appears to be a good compromise and can well be added, as a matter of course, to existing home-built tuners.

CASCODE TUNER

During the past month, we built up a second tuner to the same general pattern but using a "cascode" RF stage in place of the pentode. The new version worked well from the outset and needed only a touch up of the coils to produce good performance.

With both tuners available, we simply swapped from one to the other, looking for differences in behaviour, as evidenced in picture and sound.

Under these strictly practical conditions, the margin between the two appeared to be quite small, though it did favour the cascode. Since there is nothing to it in the matter of cost and complexity, any future tuners may just as well use the cascode arrangement.

On the other hand, if you have already built a pentode tuner, or want to use a pentode valve which is on hand, forget the newer circuit. Any benefit which it offers is unlikely to make the difference between a bad picture and a good picture. It isn't as much as that.

For the sake of those who may wish to try the cascode tuner, we reproduce the complete circuit diagram. For the most part, it follows the original circuit but a twin triode, with its relevant circuitry, replaces the pentode.

The cascode circuit has long been popular among the amateur fraternity for its low noise characteristic and near-phenomenal results have been obtained by the careful combination of valve types operating conditions, layout and neutralisation to secure optimum signal-to-noise ratio.

TV REQUIREMENTS

In a television receiver, the more pressing need is for simplicity, a wide pass-band and adaptability for multi-channel operation. Commercial design has therefore gravitated around a few twin triode types, especially designed for this class of service.

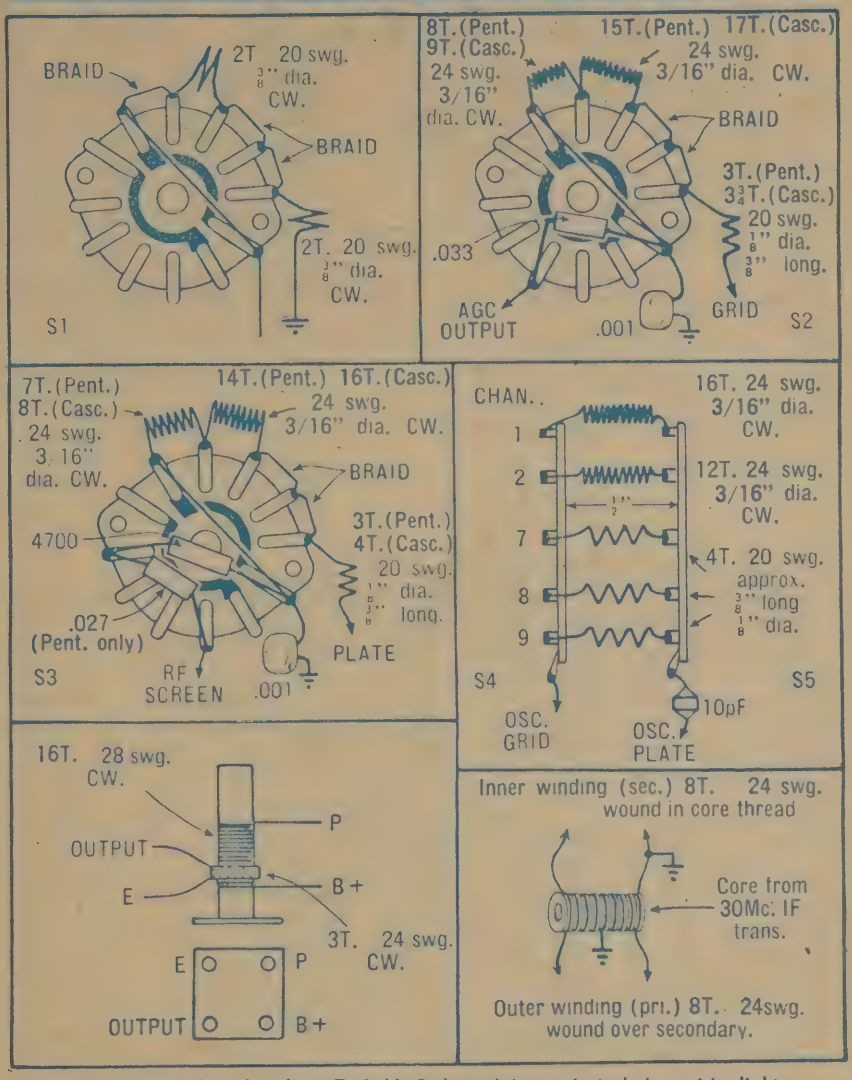
We have specified such a valve for the circuit, a type 6BQ7A, which is currently being used in many commercial receivers. We have also followed the common practice of connecting the two sections in series as far as DC supply is concerned.

The input circuit is quite conventional, signal being fed to the grid and initial bias generated at the cathode.

In the presence of input signal, the plate current of the first triode varies at signal frequency. The plate load for this section is not a tuned circuit; if it were the triode would oscillate due to grid-plate capacitance.

The variation in plate current is applied, rather, to develop a voltage across the cathode-grid-plate structure of the second triode, which is connected in series with it.

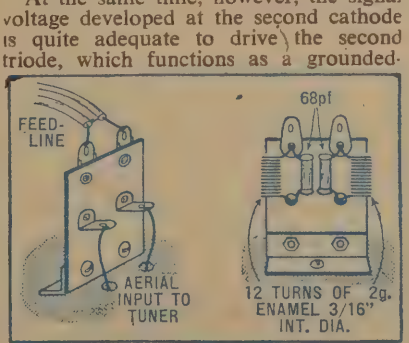
DETAILS OF THE SWITCH WIRING



Here is the coil data for the .T. & H. 5-channel tuner. It includes, with slight corrections, the original information for the pentode tuner, together with extra data for the cascode version. Figures refer to the inside diameter in every case and will be only valid if the original layout is followed in every detail.

The cathode input impedance of this second triode is quite low and the first section cannot develop enough plate signal voltage across it to become unstable due to plate-grid feedback.

At the same time, however, the signal voltage developed at the second cathode is quite adequate to drive the second triode, which functions as a grounded-grid-amplifier. This second stage gives good amplification, again without danger of instability, signal output appearing across the tuned plate circuit.



Here are the essential details of an IF filter which can be connected in series with the aerial feedline. It mounts on top of the tuner in place of the original aerial connection tagstrip.

In point of fact, the second grid is grounded only for the signal frequency. As far as DC is concerned, it is held to a potential about half that of the HT supply. The directly coupled cathode and plate tend to stabilise automatically at about the same voltage level.

AGC applied to the first grid limits the current through both valves, giving an overall grid base somewhat longer than the usual high-frequency pentode.

Physically, the cascode tuner differs very little from the pentode version and most of the constructional information given in the February 1957 issue still applies.

Obviously enough, the valve hole intended for a 7-pin socket must be opened out enough to accommodate the 9-pin socket required by the 6BQ7A.

Mounting holes need to be drilled so that 9-pin of the socket faces directly inward, bringing the input grid and out-

CHANNEL MASTER

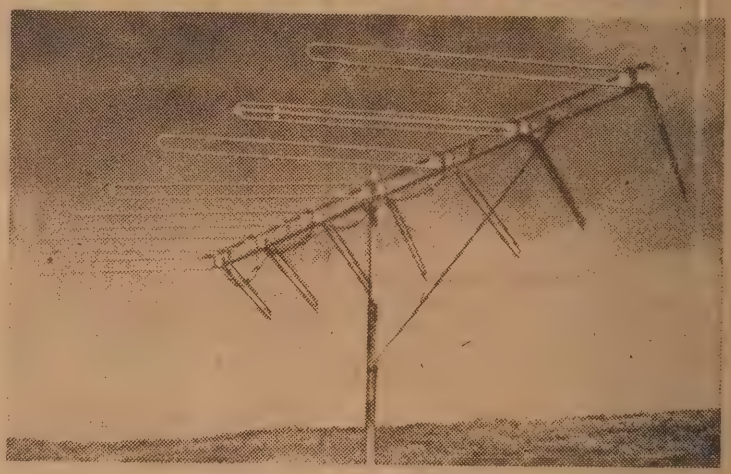
releases the

T-W

the world's first

"Travelling Wave"

TV Aerial



T.W, 7 Element Model 350

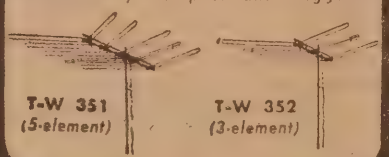
WHAT THE "TRAVELLING WAVE" PRINCIPLE MEANS

- Ideal phase relationships on all channels.
- Optimum impedance matching on all channels.
- Equal flow of current in all dipoles on all channels.
- Fullest use of transmitted energy on all channels — all elements except reflector are "driven."

IN SHORT — FABULOUS PERFORMANCE ON ALL CHANNELS

SENSATIONAL 3 AND 5-ELEMENT MODELS!

Amazing T-W performance for suburban and near-fringe areas, too! Wonderfully compact and rugged!



T-W 351 *(5-element)*

T-W 352 *(3-element)*

Revolutionary new design provides picture quality never before possible

After two years of research—a completely new kind of VHF Aerial, operating on revolutionary new electronic principles. The T-W is Channel Master's greatest achievement.

THE T-W BRINGS BETTER TV PICTURES IN SCATTER AREAS.

Where do you live? Miles from a TV station, where good reception is a problem? Have you resigned yourself to "snow" and "ghosts" and annoying interference because your home sweet home is in a fringe area? Now, there's an answer for you! This completely new Channel Master T-W aerial is designed to make practical use of the sensational, high-power "Travelling Wave" principle. That means it electronically reinforces the signal on all channels (1 to 10). What's more, this new design actually rejects unwanted signals as it pulls in at full power the channel you're tuned to.

The Channel Master T-W offers exceptional resistance to wind stress . . . lasts years longer than other aerials. It's all aluminium . . . can never rust. Double-strength "truss" construction throughout makes it the most durable home aerial ever designed. The 7-element T-W brings in stations beyond the range of other colinear or composite aerials. 5-ELEMENT and 3-ELEMENT models are engineered for near-fringe or suburban areas.

CHANNEL MASTER LEADS THE WORLD IN TELEVISION AERIAL RESEARCH

Only Channel Master could produce an aerial like the T-W. Enormous facilities for research and field testing were required. American problems of vast spaces and the need for taking reception over wider areas are the same as in Australia. Channel Master's Australian engineers feed survey information, meteorological data, contour maps, etc., to the American laboratories. The result is a service to Australian installation companies and radio retailers that is incomparable. Any problems you may have, call Channel Master — they have the answers.

Distributors: N.S.W.— Ferris Bros. Pty. Ltd., 252 Dowling St. East Sydney. FA6643.
Vic.—W. Franki (Melb.) Ltd., 380 Bourke St. Melbourne.

Manufactured by **CHANNEL MASTER PTY. LTD. (Inc. in Vic.)**

752 PITTWATER ROAD, BROOKVALE. XW0221 182 YORK STREET, MELBOURNE. MX6512.

World's Largest TV Aerial Manufacturers

put plate pins close to the relevant switch sections.

The small diagram reproduced herewith shows the location of components around the 6BQ7A socket. All other components occupy the same positions as specified for the original pentode tuner.

Capacitances associated with the cascode are slightly lower than the pentode and allow some increase in the inductance of the grid and plate coils. We have modified the data accordingly to cover both versions.

The cascode tuner also draws slightly less current than the pentode and therefore operates at slightly higher voltage through the specified dropping resistor This is quite in order.

FINE TUNING

While constructing the new tuner, we took the opportunity of replacing the original gear-driven fine tuning capacitor with a shaped vane, as used in many commercial tuners. While the capacitor is the easier method — if you have the capacitor — the vane idea was shown to be quite practical and can be used on either version of the tuner.

The method adopted was to punch an octal valve hole in the front of the tuner box in the position shown. A scrap of 1/8th perspex was mounted behind the hole, held at one corner by the switch rod and at the other by an additional bolt.

A further scrap of perspex was cut to a circle which just fitted the valve hole. Purpose of this second piece was to support the fixed plate out from the face of the box.

The accompanying sketch shows, full size, the shape of the fixed plate and the moving vane.

This latter was drilled next, to be a tight push fit over a length of tubing, concentric with the switch shaft. By rotating the vane, it was then possible to select a position for the fixed plate, on the perspex support, such that the vane progressively obscured more of it as the shaft rotated through 180 degrees.

Having selected the position, we drilled straight through the fixed plate and both layers of perspex. The fixed plate was then indented to receive the head of a countersunk bolt and the outer disc of perspex was countersunk to receive the indentation. A single nut lug on the inside held everything together and provided means for connecting the fixed plate to the oscillator circuit, as required.

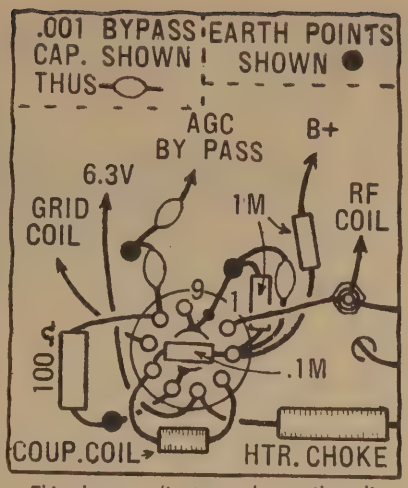
CLEARANCE

For suitable capacitance variation, the vane in our case needed to clear the fixed plate by about 3/32 inch and it was duly aligned and sweated to the tube so that it could occupy this position.

To maintain tension on the vane, we looped a small brass bracket over the top edge of the tuner box, with a clearance hole for the switch shaft. A spiral spring from a valve can, slipped over the shaft and behind the bracket, is enough to force it out at moderate pressure.

The vane, on its tube was simply forced in against this springy bracket and retained by cutting a ring in the switch shaft to take a circlip from a discarded potentiometer.

So much then for discussion of the tuner, which has almost assumed the proportions of an article in its own right. But why worry? Our purpose this month is simply to discuss aspects of the design, as they have arisen out of earlier articles, and without any special preoccupation with sequence.

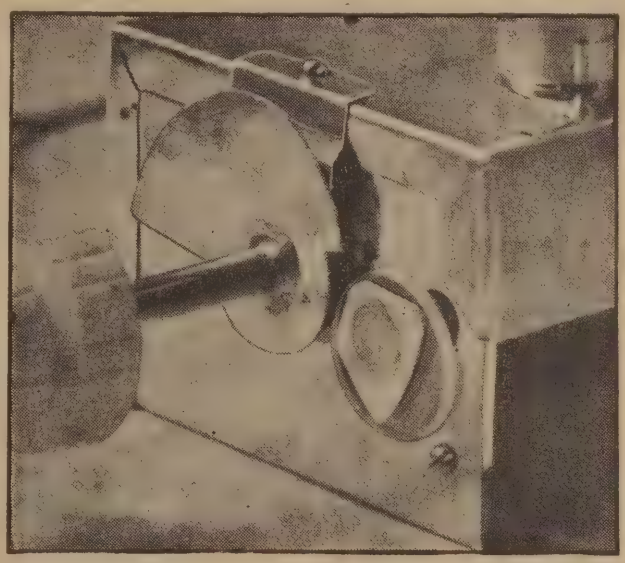


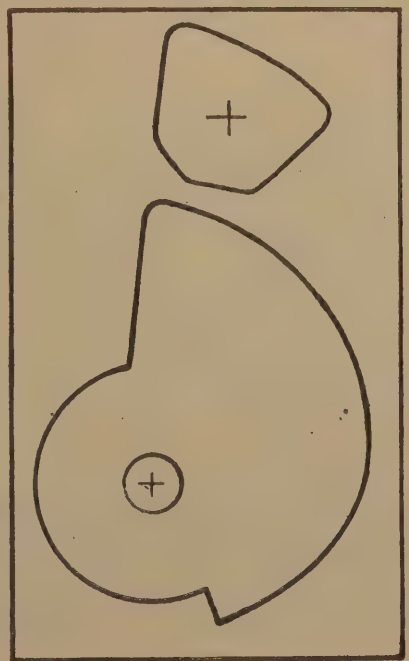
This layout diagram shows the disposition of components around the 6BQ7A socket in the cascode version of the R.T. & H. TV tuner. It should be used in conjunction with the diagram on page 65 of the February, 1957, issue.

For those who may find difficulty in obtaining a miniature capacitor for fine tuning, the idea illustrated above is perfectly satisfactory. The springy bracket should be made slightly convex and exert just enough pressure on the vane to allow smooth movement without binding.

☆

These outline diagrams are exact full-size copies of the original brass vane and fixed plate. Their shape was determined by inspection and does not necessarily follow a precise law





At the IF amplifier is concerned, we didn't even try to include it in this article. We passed the whole project over to Phil Watson and the result of his labours appears elsewhere in the issue.

Small points like heater bypassing have been rationalised by discussion with the components manufacturer and the information included on the circuit. Nothing more need be said here about the basic IF amplifier.

In an earlier issue, we mentioned the possibility of feeding the intercarrier sound strip from the trap circuit in the video cathode, rather than directly from the video detector. This is done in some commercial receivers, partly with the idea of minimising loading on the detector and partly to obtain a small amount of "free" 5.5 Mc amplification. (The secondary winding is shown dotted in our circuit.)

In point of fact, no voltage amplification can be obtained from the video amplifier valve because its action in respect to the 5.5 Mc component can only be that of a cathode follower with a gain probably a good deal less than unity. Any voltage step-up must be obtained by ensuring that the tuned winding feeding the intercarrier grid has many more turns than the trap. In other words, it must have a substantially higher L/C ratio.

As a quick check from the home builder's point of view, we tried winding a trap on a Q-plus VIF7 coil, which already has a high impedance winding intended to resonate at 5.5Mc. The trap was wound about ¼in above the existing winding and trimmed so that the core would peak about half-way in. The two coils must not be placed too close, of course, otherwise the efficiency of the trap may be impaired.

The chassis layout is such that the intercarrier sound channel can be fed readily from the modified trap coil by coupling to it through a small capacitor, instead of back to the video detector

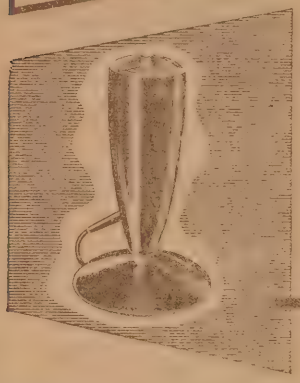
On this admittedly tentative basis, the scheme seemed to offer only slight advantage and had to be abandoned for the time, in the face of more urgent matters. We gained the impression that its

acos

A COMPLETE RANGE

CRYSTAL MICROPHONES
MICROPHONE INSERTS

FOR EVERY PURPOSE



DESK or HAND MICROPHONE, MIC36

This Microphone is ideal for home recording and public address, etc. Response unexcelled for its size and price. The performance is not affected by vibration, shock or low frequency wind noise. Omni-directional frequency response substantially flat from 30 to 7,000 c.p.s. Recommended load resistance not less than 1 megohm, dependent on low frequency response. Can be supplied complete with switch and floor stand adaptor, as required, at a small extra cost. **PRICE, £6/18/6.**

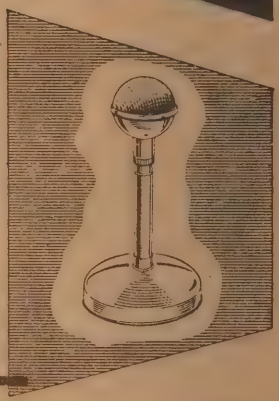
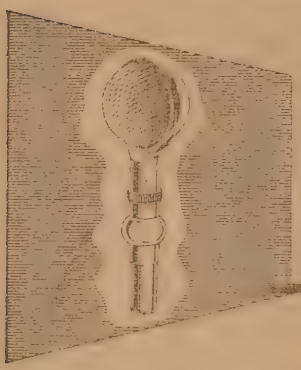


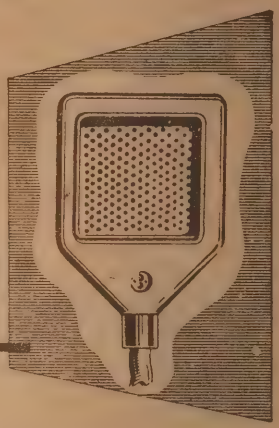
TABLE or STAND MICROPHONE, MIC22

This omni-directional Microphone is robust in construction, with a pleasing appearance. Vibration, shock or low frequency wind noise will not affect the performance. The low frequency cut-off is dependent on the load resistance. The cut-off is given by the equation, F = 80 divided by R, where F = c.p.s., R = megohms. An adaptor (floor mounting) is available at low extra cost. **PRICE. £9/18/6.**



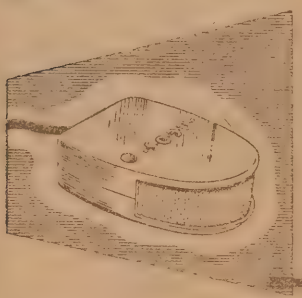
HIGH-QUALITY MICROPHONE, MIC16

This Microphone incorporates the world-famous floating crystal sound cell construction. Its fine performance is not affected by vibration or shock. The fidelity is not impaired by low frequency noise. **PRICE, £24/19/6.**



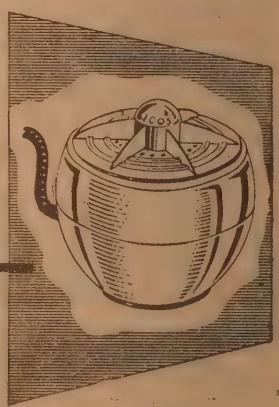
LAPEL MICROPHONE, MIC28

Designed to give freedom of movement, this Microphone is small and non-directional. Housed in a soft, moulded-rubber case, which gives protection against shock, it is provided with a pin at the rear of the case for pinning to the lapel. **PRICE, £5/19/6**



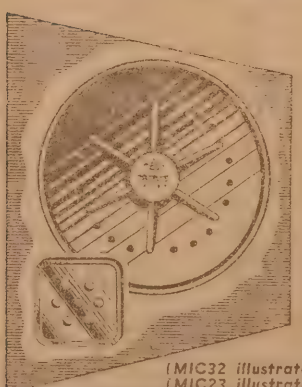
GENERAL PURPOSE, MIC35

The MIC35, is ideal for amateur transmitters, public address, etc. Housed in an attractive die-cast case, it features a high sensitivity and substanially flat characteristics. Provided with a built-in shunt resistance of 2 megohms, it will, when connected to the grid of the input valve, give a substantially flat response from 50 to 5,000 c.p.s. **PRICE, £2/15/-.**



HAND or DESK MICROPHONE, MIC33

This Microphone has been designed for the high quality public address and home recording field. High sensitivity and flat characteristics are obtained by a specially designed acoustic filter. Housed in an attractive plastic case with an unexcelled response for its size and price. Unaffected by vibration, shock or low frequency wind noise. Omni-directional frequency response substantially flat from 30 to 7,000 c.p.s. **PRICE, £6/18/6.**



CRYSTAL MICROPHONE INSERTS

These inserts are available in varying sizes, ranging from as small as ⅛ in. square to 1-⅛ in. round, with various thicknesses from 5/32 in. to ⅜ in. Suitable for every purpose, such as hearing aids, public address, tape recording, amateur transmitters, etc., they have responses from 2,250 c.p.s. to 3,500 c.p.s. at -5 db to -30 db. Insert can be supplied with or without 10 meg. resistor as required.

MIC19/4 and MIC32, **£2/15/6**; all others, **£1/19/6.**

(MIC32 illustrated)
(MIC23 illustrated)

Sole Australian Agents:

AMPLION (A'sia) PTY. LTD. 88 Parramatta Road Camperdown, Sydney, N.S.W. Phone LA 6124.

Victorian Distributors: DISTRIBUTORS CORPORATION, 403 Bourke Street, Melbourne.

success would depend of having just the right kind of step-up transformer, preferably mounted in the IF strip and feeding directly to the first inter-carrier grid.

The video amplifier, the contrast control and the intercarrier amplifier are sufficiently close to allow this to be done.

We may have more to say about it later if such a transformer comes to hand or if we are able to do more work on it ourselves.

What we have said, however, may serve as a guide to any constructor who may wish to experiment along these lines.

Mention was also made in the original circuit of the possibility of adding an extra stage to the intercarrier sound channel for use in fringe areas. This is an important matter and we have gone to some trouble, in the last couple of weeks, to assess its likely significance to the home constructor.

PRACTICAL TESTS

To this end, we set up the prototype receiver in an area of only moderate signal strength then progressively reduced the signal input by degrading the aerial and/or operating the receiver with no aerial at all.

Under these conditions it was possible to get the signal level so low that the picture on the screen was either non-existent or barely discernible. At all times, however, the sound channel remained clearly operative, though with some background noise.

Switching on an electric drill nearby put an obvious interference pattern on the screen but the power cord had to be brought right against the aerial input terminals before any sign of noise could be heard in the loud speaker.

In other words with the single 5.5 Mc amplifier stage as in the original receiver, the resolution and noise rejection characteristics of the sound channel were clearly better than the picture channel and there was no question of conditions arising where picture would be available but not sound.

It must be stressed, however, that these observations were made with the IF channel properly aligned and with a correctly placed sound plateau. If the pass band of the IF channel is too narrow, or the sound plateau is non-existent, there may be trouble with inadequate sound level, or frame buzz or difficulty in tuning picture and sound together.

These are problems of component design or regeneration or alignment, rather than the mere number of stages involved. The fact remains that, in a properly adjusted receiver the results were as stated.

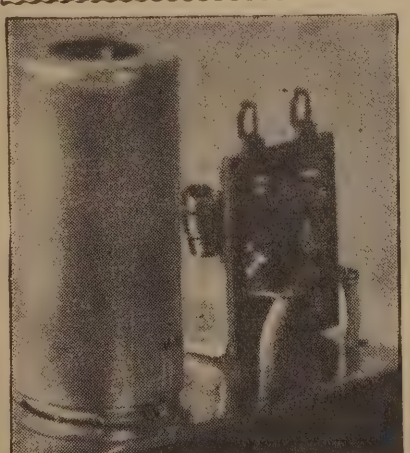
In the face of such observations, it is rather hard to make a convincing case for an extra sound stage. Nevertheless to satisfy our curiosity, we made the necessary additions.

Physically, it involves mounting a VIF7 coil and a 6AU6 valve in the holes provided for them, in front of the existing 5.5 Mc amplifier. The layout is not above criticism when this is done, because the 5.5 Mc signal lead has to be taken back down the centre of the channel, from the video detector to the first 6AU6 grid.

We talked this over with the manufacturer who claimed that no trouble had been encountered with the lead. Furthermore, it was pointed out that some commercial receiver manufacturers have entirely separate picture and sound strips with much longer connecting leads between them. The designer of the Q-plus strip was presumably much more concerned with avoiding mechanical differences between the Mark I and Mark II strips and with maintaining external input and output connections at opposite ends.

MERELY ADD COMPONENTS

Unless the constructor is keen, therefore, to turn the whole sound channel end-for-end, the only course is to place the extra valve and coil in the holes left vacant for them and to wire accordingly. The lead from the video detector can either be run straight up the centre of the chassis underneath or else through holes and above the chassis for most of the distance.



This picture shows the IF trap in position on the tuner, in place of the original tagstrip. The feed wires connect to the two top lugs.

ADJUSTING ION-TRAP MAGNETS

Last month we outlined briefly a method for setting the ion trap magnet on the 17HP4B picture tube. Here is a more detailed procedure, as recommended by RCA

This note describes a recommended procedure for adjusting ion-trap magnets to obtain maximum picture brightness and to minimise the possibility of damage to picture tubes.

Misadjustments of the ion-trap magnet may cause imperfect centring of the picture tube electron beam and result in excessive bombardment of the masking aperture within the electron gun. As a result of such bombardment, ions may be formed beyond the control of the ion-trap and produce an ion spot on the fluorescent screen.

Recommended procedure

1. Centre the deflecting yoke on the tube neck and press the mounting-bracket cushion firmly against the glass funnel. For a tube using electrostatic focus, a small adjustable centring magnet is usually required. It should be placed on the tube as recommended.

2. Place the ion-trap magnet on the tube neck. The initial position of the magnet should be in accordance with the instructions given in the data for the specific tube type.

3. Adjust the brightness control midway between its minimum and maximum positions and set the contrast control to minimum.

4. With the controls set as indicated apply operating voltages to the tube. As soon as the tube cathode reaches operating temperature, adjust the position of the ion-trap magnet by moving it a short distance forward or backward and rotating it slightly until maximum brightness is obtained at the centre of the raster.

It is important that this adjustment be made with the brightness control set, as specified in (3) midway between the minimum and maximum positions so as to keep the beam current low. It is equally important that the adjustment of the ion trap-magnet be completed quickly because operation of the picture tube with the ion-trap magnet improperly positioned may damage the tube.

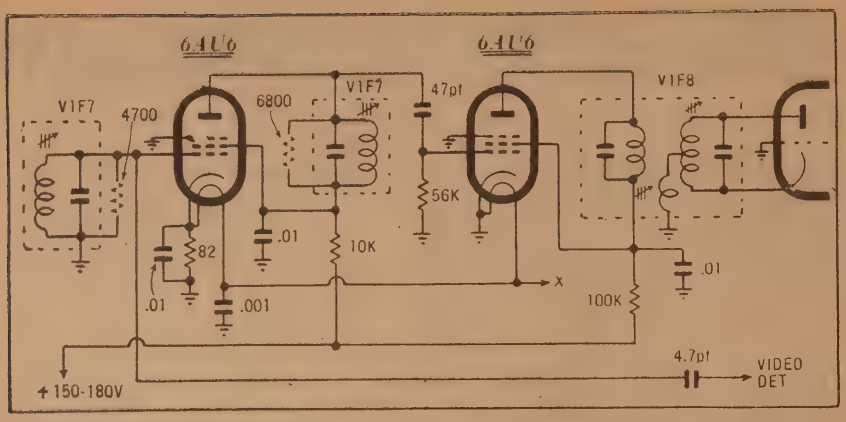
With certain picture tubes, particularly those utilizing electrostatic focus, two positions of the ion-trap magnet may be found in which maximum brightness is produced. The correct position is that which is nearer the base of the tube.

5. Focus the pattern and centre it. If a shadow appears at the edge of the raster, check the position of the deflecting yoke to make sure that it bears firmly against the glass funnel and centred on the picture tube neck.

If any shadow remains, eliminate it by adjusting the position of the centring magnet. If this adjustment reduces maximum brightness at the centre of the screen or disturbs centring and focus, repeat steps (4) and (5). Never adjust the ion-trap magnet to centre the pattern; never adjust it to eliminate neck shadow if such adjustment reduces the brightness at the centre of the screen.

6. With the picture control in its minimum position, turn the brightness control to its maximum setting and readjust the ion-trap magnet as indicated in (4) until maximum light output at the centre of the raster is again obtained. Bowing of opposite sides of the raster in the same direction may occur if the ion-trap magnet has improper rotational position.

7. Adjust the brightness and contrast controls to obtain a picture of normal brightness. Readjust centring and focus if necessary. If this step requires any appreciable change in centring or focus, repeat operation (6) to recheck position of the ion-trap magnet.



Here are the circuit details for the extra intercarrier IF stage. We used shunt resistors across the windings for complete stability, though they are not specified by the manufacturer. We also used a 100K resistor to feed the second valve, as against the manufacturer's figure of 22K.

The extra coil and socket must be orientated, of course, to keep the other leads short.

The circuit used is shown in the accompanying diagram and differs somewhat from that recommended by the manufacturer. Note that a .001 mfd bypass is specified at the heater pin of the extra 6AU6, being transferred, if you like, from the existing 6AU6.

In our particular case, the augmented channel showed signs of regeneration, which is never a good thing where FM sound is concerned. At certain critical core settings it was, in fact, possible to promote active oscillation. This was not evident as an audible sound from the speaker but it showed up as a sudden jump in limiter grid current and an equally sudden drop in sound level with accompanying distortion.

To secure complete stability, we found it desirable to shunt the circuits as shown dotted. This is not done in the ready-built Mark II units and we are rather at a loss to explain the discrepancy. However, it is a simple matter to add or omit loading resistors, as seems necessary in individual cases.

Aligning the two-stage strip needs a little more care than the simpler version, because the limiter action blankets the effect of the adjustments. It aligning on the station, a simple method is to clip a lead from a VTVM through a 1-meg. isolating resistor to the grid pin of the limiter valve. This will give quite clear indication as to the alignment of all preceding circuits.

Now transfer the lead to the ratio detector output. Assuming that the ratio detector is slightly unbalanced, the primary of the transformer can be tuned for maximum deflection and the secondary for balance or zero DC output.

But what of performance?

In practice, the difference between the simple and more complex sound channel was not immediately obvious. There was little change in the normal setting of the volume control and no obvious change in signal-to-noise ratio under ordinary signal conditions. Only when the signal input was reduced again to the point where the picture was disappearing was there any perceptible improvement in signal-to-noise ratio.

NO FRAME BUZZ

The main point of difference appear- to be in the ability of the sound channel to produc adequate output with wide variation in the Fine Tuning Control. It could be made to produce intercarrier buzz only with difficulty, and the sound was retained to quite unlikely limits of picture tuning.

In other words, the extra stage cannot be recommended on the basis of more or better sound in a well-adjusted receiver. Its main effect is to allow more tolerance against inaccurate alignment or poor tuning by non-technical members of the household.

If you think that such a reward is worth the cost and effort, you can make the addition.

So much for the sound channel

Last month we mentioned the possibility of adding Keyed AGC to the receiver in place of the simple circuit. It was our intention to do this but, through pressure of other work, we have simply not been able to manage it. Any reader who is impatient to try out the scheme can refer to the provisional circuit on page 99 of the May issue.

It should work but, of course, only actual trial can reveal any unsuspected complications.

It should be noted in passing that keyed AGC will not contribute anything to the ultimate sensitivity of the receiver and its inclusion is therefore not warranted, merely because the receiver is to be used in a fringe area.

On the contrary, its value is more likely to be apparent in strong signal areas, where the simple system may be hard put to it to limit gain sufficiently. Keyed AGC is also amplified AGC and gives good control of front-end gain in areas of high signal level.

SMALL COMPONENTS

One other point about the circuit warrants special mention. When originally released, the supply position on many small components was difficult, to say the least. Quite deliberately, therefore, we refrained from making hard and fast specifications on voltage ratings, preferring to take a calculated risk.

Accordingly, we assumed the use of ordinary mica capacitors throughout the

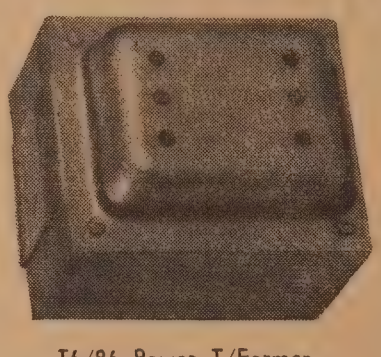
(Continued on page 127)

FOR YOUR
"R.T.V. & H." T.V. SET
USE

IRONCORE

POWER TRANSFORMERS
AND CHOKES

Also available to suit
PHILIPS CIRCUIT.



T6/86 Power T/Former.
for "R.T.V. & H" T.V.

Note these Points:—

★ Fully Guaranteed.
★ Top Quality Workmanship.
★ Grey Hammertone Finish.
★ Prompt Delivery.

TO BE SURE OF QUALITY, ASK YOUR DEALER FOR IRONCORE T.V. & RADIO POWER TRANSFORMERS & CHOKES.

IRONCORE TRANSFORMERS Pty. Ltd.

HIGSON LANE, MELBOURNE C.1.

Electric and magnetic effects in space. Changing fields, a fixed conductor and induced current. The tuned circuit, aerial coupling and the selection of signals. Values of inductance and capacitance. How earphones work. Detection and the audio signal. A complete crystal receiver circuit.

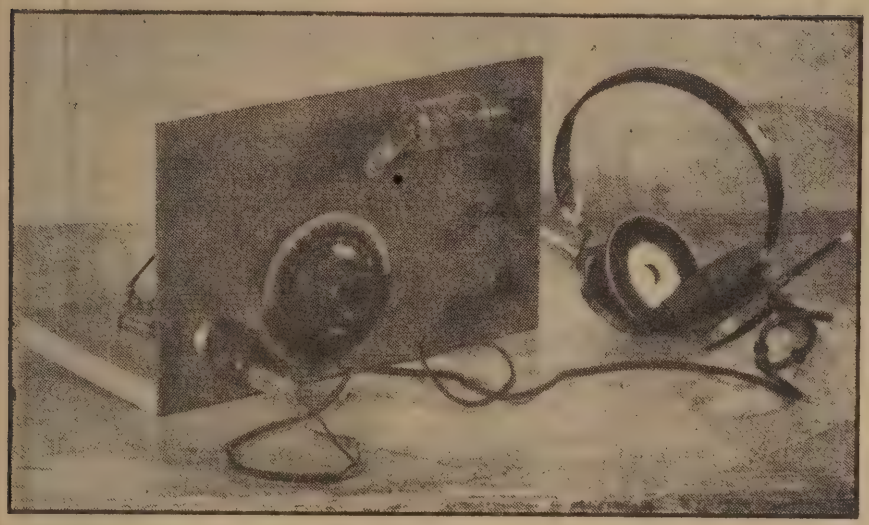


Figure 1. A home-made crystal set like this one is about the simplest practical receiver. For all its simplicity, however, it can illustrate practically many basic facts. If you've never built a crystal set, now is the time to start.

The How and Why of Radio Reception

Last month we described the process of radio transmission; how code, speech and music can be carried by radio waves over great distances. In this article we see what happens at the other end, how those same radio waves are intercepted, selected and changed back into the sounds we want to hear

TO get a clearer picture of how a receiver operates it may be helpful to retrace our steps a little and to think again of the way in which radio energy can be broadcast or radiated into space. The reader may then be better able to understand how such energy can be intercepted.

Last month we likened a transmitting aerial to a huge tuned circuit surrounded, in operation, by alternating electrostatic and magnetic fields. We pointed out that these fields might extend for hundreds, even thousands of miles.

ELECTRIC FIELDS

Many find this difficult to comprehend, because electrical energy is so intangible, particularly when there are no wire circuits to carry it. As it happens, however, one doesn't need to search very far to find quite homely illustrations of how electrical energy can bridge empty space.

Everyone is familiar, for example, with the old trick of rubbing an ebonite or plastic rule against dry cloth and seeing it attract small scraps of paper from the surface of a table.

A lecturer might explain the effect as due to the attraction between two bodies carrying an unlike electrical charge. This would be true but, for our present purpose, it illustrates graphically the fact that an electrical charge can exert an influence THROUGH SPACE, even though it may only be over a few inches in this particular case. But that is not all.

There is the equally familiar case of a permanent magnet and the way in which it can attract to itself small iron and steel objects, like needles and nails. Just what the force of magnetism is baffles even the scientists, but there is no denying its effect.

Nor is the effect of a magnet measurable only in inches. Bring a magnet within many feet of a sensitive compass and the needle will deviate perceptibly from its normal reading, depending on the way in which the magnet poles happen to lie in respect to the earth's magnetic field.

Of course a permanent magnet has a steady undirectional field, but we can easily change that. If the magnet is rotated in the appropriate fashion its field will rotate—or alternate—also and the compass needle will swing to and fro. Or we could gain the same effect by substituting an electromagnet and passing through it a slowly alternating current. The compass needle would again swing to and fro.

But here is the vital point of the illustration: There is no tangible connection between magnet and compass, just a magnetic field ACTING THROUGH SPACE. One could very rightly regard the magnet and its manipulations as a transmitter of energy and the compass needle as a receiver, reacting to its influence.

AIR NOT NEEDED

And remember, it would act just the same if magnet and compass were both in a vacuum. Not even air is necessary to sustain electrical phenomena.

Now substitute for the magnet, in your thinking, a transmitting aerial which can produce a much more powerful magnetic field and an electrostatic field as well, alternating or varying at a frequency determined by the transmitter. (See figure 2.)

Substitute for the compass needle a receiver, which is much more sensitive to such variations, and you have the picture. The same kind of forces which you can so easily demonstrate over a distance of inches or feet are shown to operate over vastly greater distances, given the right kind of apparatus.

Having made that point we can recall something else from an earlier lesson which will also help explain the process of radio reception.

Think back to Chapter 3 and the discussion of inductance, coils, generators and such like. Remember the general law that "an EMF is always induced in a fixed conductor, which is cut by moving lines of force or, yet again, in a conductor which itself moves through a stationary magnetic field."

Perhaps it might have been better had we said "changing" rather than "moving" lines of force.

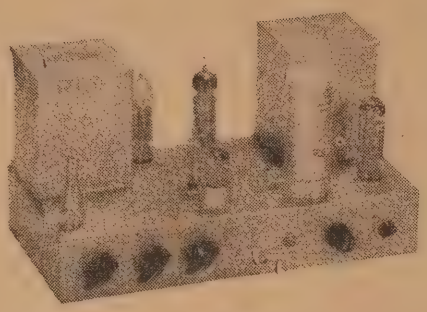
The first step toward radio reception is to provide an aerial, which may range from a rather pretentious installation to a mere length of wire tacked to the picture rail. This constitutes a "fixed conductor."

AERIAL RADIATION

When a distant transmitter commences operation, it creates a weak but nevertheless definite alternating magnetic and electric field in space, and therefore in the vicinity of the receiving aerial.

In other words, we have a fixed con-

HI-FI AMPLIFIERS AND TUNERS



SINGLE CHASSIS LOW LOADING

MULLARD 5 VALVE 10 WATT AMPLIFIER as described in the Mullard Booklet.
"The Mullard 5 Valve 10 Watt HIGH QUALITY AMPLIFIER CIRCUIT" and incorporating later modifications.
THIS AMPLIFIER CAN NOW BE SUPPLIED IN VARIOUS FORMS TO SUIT INDIVIDUAL REQUIREMENTS.

1 Single chassis normal loading with 125MA power transformer, and 5V4G rectifier
Size 14" wide, 8" deep, 8" high
Weight 21lbs.

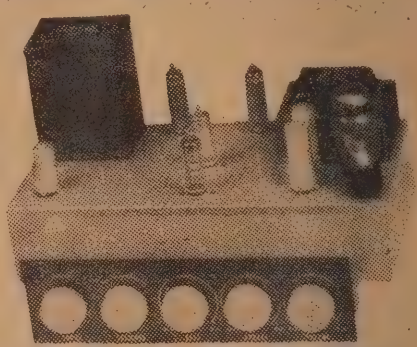
2 Single chassis low loading with 80MA power transformer and 6V4 rectifier.
Size 12½" wide, 6½" deep 6" high.
Weight 9½lbs.

3 As either 1 or 2 above but with controls and P.U./Radio switch in separate control box for convenient cabinet mounting.

4 With PRE-AMPLIFIER 'B' which includes an additional EF86 as an amplifier incorporating Record Playback compensation as well as Bass, Treble and volume controls and increases sensitivity
Sensitivity:— Radio/Tape 100MV
Microgroove: 50MV
78 R.P.M.: 60MV
Microphone: 10MV

INTERSTATE TRADE ENQUIRIES WELCOME

Valves:—EF86 First Stage 12AX7 Phase Splitter 2X6BQ5 Output.
Power Output:—10-13 Watts.
Freq Response:—10 Cycles to 20KC Flat.
Sensitivity:—600 M.V.
Bass Control:—Plus 15 to Minus 12.
Treble Control:—Plus 15 to Minus 20DB.
Back Ground Noise: —Minus 75DB 10W.
Distortion:—Better than .1%



5/10 AMPLIFIER (NORMAL LOADING) WITH PRE-AMP "B"

Extract of report from Mullard Aust. Pty. Ltd. Lab.:-

"We have now had an opportunity of investigating the amplifier which you have submitted for test. We have thoroughly tested this amplifier under square wave and pulse conditions, we have also vetted valve operating conditions in this equipment and find that this amplifier complies with the specifications of the orginal design

Sgd. J. R. Goldthorpe."

— TUNERS —

- **LT1, 6AE8 converter 6BH5, 1FA, 12AU7 detector and LoZ output. 10Kc whistle filter. Broad/Sharp IF switch.**
- **LT2. As LT1 but with aerial band pass.**
- **LT3. 6BH5 RF amplifier, 6AE8 converter, 6BH5, 1FA, 6N8 detector and audio. Has its own volume control. Intended for low signal areas.**
- **PL1 As Playmaster Tuner No. 2 (July, '53), but with 6BH5, IFA and incorporating its own power supply and volume control.**
- **F.M. Tuner as featured in R, TV and H, Jan., '57.**

THIS MONTH'S SPECIAL VALVES 1C7G, 6/-. 1Q5G. 9/-. 1P5G, 9/-. 6U7G, 7/6. New, in cartons. Freight free in dozen lots.

LM1554 **MIRROFONE ELECTRONICS** LM1554

403 New Canterbury Rd., Dulwich Hill, N.S.W.

ductor and a moving (or changing) field. Of necessity, a current and voltage must be induced in the aerial. Obviously enough, this induced current and voltage will alternate in step with the signal from the transmitter, at the same "carrier" frequency.

If the transmitted signal is amplitude modulated, rising and falling in strength, then the signal induced in the aerial will do likewise. If the transmitted signal is frequency modulated, varying to either side of the nominal figure, then the induced signal at the receiving end will vary also.

In other words, our signal has arrived!

SIGNAL SELECTION

But a problem immediately presents itself: How can an aerial distinguish between the wanted signal and others which may be arriving simultaneously from other transmitters?

The answer? It doesn't!

An aerial is more or less receptive to all signals and, at any one instant, it may have induced in it current and voltage originated, not just by two or three, but by hundreds of radio stations. The process of selecting the wanted signal is performed in the receiver by something else we learned about earlier—by a tuned circuit.

You will find all about tuned circuits in Chapter 5, but, just to refresh your memory, they involve an inductor and capacitor connected normally in parallel. When a current is initiated in the inductor, the resulting magnetic field generates a potential which charges the capacitor.

The capacitor then discharges back through the inductor, creating a new magnetic field opposite in sense to the first one. When the capacitor has discharged, the magnetic field begins to collapse and, in so doing, charges the capacitor in the reverse direction. Then the charge begins to flow back through the inductor and creates a new field. So the process continues, as explained earlier, to produce a damped oscillation.

This oscillation has a natural frequency which is governed by the amount of capacitance and inductance in the circuit. Increasing the value of either one (or both) lowers the so-called "resonant" frequency, while decreasing the value (or values) raises the resonant frequency.

This natural oscillation in a tuned circuit can be promoted and sustained by feeding into it energy or pulses with a corresponding repetition rate. It will not respond in the same way to energy or pulses having a completely different repetition rate.

MECHANICAL ANALOGY

In this respect, the behaviour of a tuned circuit can be likened to the mechanical oscillation of a child's swing. Quite mild pushes, properly timed, can keep the swing moving freely. On the other hand, a great deal of energy can be expended to no purpose by trying to make the swing oscillate at other than its natural frequency.

To change the oscillation rate, it is necessary to vary the weight on the swing or the length of the ropes.

So it is with a tuned circuit or, should we call it, a tuning circuit? It will oscillate readily at its own resonant frequency but not at any other.

Now have a look at figure 3a. It depicts a tuning circuit, with one side connected to earth and with an aerial

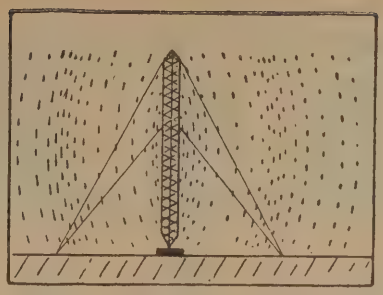


Figure 2: We reprinted this circuit from last issue to recall the way in which radio energy is broadcast. A transmitting aerial may be likened to a huge tuned circuit which creates electric and magnetic fields in the space surrounding it.

running to a tapping on the inductor, or coil, if you prefer the latter term.

There are two points of immediate interest in this simple circuit.

In the first place the natural path for signal currents picked up in an aerial is between aerial and earth. Therefore the logical step is to provide a path from aerial, through portion of the tuned circuit, to an earth connection.

The second point is that an aerial is very seldom connected directly to the active end of a tuning coil. To begin with, an aerial has its own inductive and

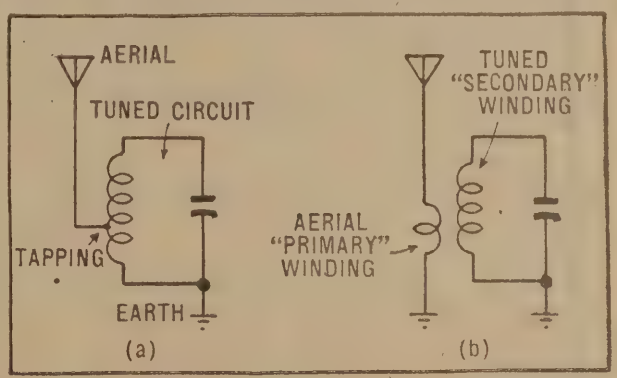


Figure 3: This diagram illustrates two popular methods of connecting a receiving aerial to a tuned circuit. Method (a) involves a tapping on the coil; (b) shows a "primary" winding adjacent to the earthed end of the tuned coil, which is often referred to as the "secondary" in such a case.

capacitive qualities and these, connected directly to the tuned circuit, can drastically alter its intended tuning range.

But no less important is the fact that an aerial does not retain energy within itself, as a tuning circuit tends to do. Even though erected with the idea of receiving signals, an aerial may radiate and therefore lose some of the oscillatory energy present in the circuit to which it is connected.

The end result is that a tuned circuit which is heavily "loaded" by the receiving aerial may be less efficient than one which is not so heavily loaded. This being so, it is common practice to connect the aerial across only a small portion of the tuning coil.

Alternatively, the aerial may be coupled to it by means of a small winding adjacent to the earthed end of the coil. This is illustrated in sketch 3b.

Now let's see how it all works out. The various voltages and currents induced in the aerial are fed into the tower end of the coil, while traversing the aerial-to-earth circuit. By magnetic induction some of the energy is coupled to the remaining turns of the coil, but not very effectively, because the vast majority of the incoming signals bear no relationship to the natural resonance of the tuned circuit.

However, let us say that among the incoming signals is one having a frequency of 1,000 kilocycles per second, normally written 1,000Kc. We could have picked any other figure, of course, but 1,000Kc is a nice easy one which happens to be in the centre of the broadcast band.

If we wanted to select this signal from the rest the proper course would be to adjust the tuning circuit so that its natural resonance would be at this same figure. This brings about a special state of affairs.

A particular half-cycle of the 1,000Kc signal may initiate a current through the coil, create a magnetic field around the coil and apply a small charge to the tuning capacitor. Then, as the half-cycle of signal ends, the field around the coil begins to collapse, a counter EMF is generated by the collapsing field and a reverse charge is applied to the capacitor.

NATURAL RESONANCE

But because the natural resonance of the tuned circuit is equal to that of the incoming signal at 1,000Kc, the rate at which the field collapses and reverses is precisely the same as the rate of change of the incoming signal. Thus each succeeding half-cycle of the circuit's natural oscillation is supplemented by a corresponding alternation of the incoming signal.

Therefore, while incoming signals at all other frequencies have little obvious effect, the signal which happens to correspond with the resonance of the tuned circuit builds up across it a sustained oscillatory signal. Putting it another way, we might suggest that a tuned circuit responds to the signal to which it happens to be tuned and discriminates against signals on other frequencies.

This is a general statement, which must be qualified to avoid giving the wrong impression. A practical tuned circuit may not be able to discriminate completely against all unwanted signals in all circumstances. This applies particularly to very strong signals which are close in frequency to the wanted signal.

The ability of a tuned circuit to select a wanted signal and reject others having a different frequency is commonly referred to as its SELECTIVITY.

Herein lies the explanation of something that mystifies most newcomers to radio—how turning the shaft of a variable capacitor can tune signals in and out.

Now you should know! Turning the shaft changes the capacitance of the variable capacitor (or condenser, if you like to call it so) and alters the resonant frequency of one (or more) tuned circuits. In so doing, the circuit (or circuits)

ELECTRONIC A&R EQUIPMENT

TV NEWS

Available Now! A New A&R Transformer Kit for the R.T & H. Television Receiver!

Mains Transformer

For the R. T. & H. 17" T.V. Receiver

MAINS TRANSFORMER DESIGN P.T 1840
Primary: 200, 230, 240V
Secondary 290-CT-290 V @ 275 mA
Filament: 6.3V @ 9 Amps 5V @ 3A
Horizontal mounting this transformer is designed for low radiation and in addition is fitted with a copper flux shorting shield to further reduce the external magnetic field Colour coded leads Height above chassis 3¾in Base size 4¼in x 3¾in Mounting centres 3¾in x 3in Cut out 3 1/8 in x 2 3/8in Weight 11¾lb

Filter Choke

DESIGN Z 1091 Inductance 1 Hy @ 275mA, D.C D.C Resistance 30 ohms A strap clamp mounting with leads Designed for low voltage drop (Approximately 8 Volts at maximum current) Base size 4in x 2in Mounting centres 3 9/16in Height above chassis 2 9/16in Weight 2lb

T.V. Kit

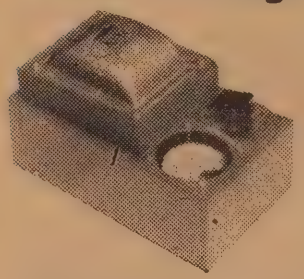
(Designed for use in T.V. circuit published by Philips Elect. Ind Pty. Ltd.)

POWER TRANSFORMER: DESIGN P.T 1790
Primary 200 230, 240V 50 cps
Secondary 230-CT-230V @ 350 mA
Filaments 2 x 6.3V @ 6 A
Horizontal mounting. Fitted with copper flux shorting shield. Colour-coded, flexible leads. Height above chassis. 3¼in. Base size 4¾in x 3¾in Mounting centres 3¾in x 3 1/16in

FRAME OUTPUT TRANSFORMER DESIGN O.1 250/
Designed to Philips' specifications A strap clamp mounting, with colour-coded leads Height above chassis 2 9/16in Mounting centres 3 3/8in Base area 3¾in x 2 3/16in

POWER CHOKE. DESIGN Z 1090.
Inductance: 3 Hys @ 300 mA D.C. Resistance—50 ohms An open clamp mounting (reversible) with leads

T.V. Voltage Adjusters



AVAILABLE IN BOTH AUTO WOUND AND DOUBLE WOUND MODELS WITH OR WITHOUT 0-250 v METER FITTED.

Designed primarily as aids to servicemen in installing and servicing television receivers these Voltage adjuster units are now being used in other applications such as correction of input voltages to Amateur transmitting and receiving gear tape recorders, Hi-Fi audio equipment etc where the load imposed is within the capacity of the adjusters

AUTO MODEL TYPE: A.T. 1215 (illustrated)

Input voltage (50 cycle A.C.) 190 195 200, 205, 210, 220 230 or 240, adjustable by means of tapping switch. Input connector Bakelite 3-wire type enabling any convenient length of mains cord to be used Output voltage 200 to 240 as selected internally Output power 300 V.A (maximum output current 1.3 A.) Output voltage indicator 0-250V A.C Meter (Optional) Output socket standard 3-pin flush type Weight including meter 7¼lb

DOUBLE WOUND MODEL TYPE: P.T. 1832

Input voltage as for Auto model Input connector as for Auto model Output voltage 200 230 240 as selected internally Output power 200 V.A. (Maximum output current 0.8 A.) Output voltage indicator as for Auto model. Output socket standard 3-pin flush type Weight including meter 11lb

FREE! Reference Folders Pamphlets

Specification sheet and price list No 2 has just been released. This handy reference folder gives full details of electrical specifications physical dimensions (illustrated for easy reference) and prices of our standard range of power and audio transformers

The various applications for the range of A & R voltage adjuster units are detailed in a fully descriptive, illustrated pamphlet now available

Any of our distributors will be pleased to supply this literature on request.

ELECTRONIC A&R EQUIPMENT

A & R ELECTRONIC EQUIPMENT CO. PTY. LTD.,

378 St. Kilda Road, Melbourne. C.1. Victoria.

Stocks available from:—

N.S.W AGENTS: R. H. Cunningham & Co., P/L., 16 Angas St., Meadow Bank.

VICTORIA: Homecrafts P/L J H Magrath & Co P/L. Radio Parts P/L., Warburton Franki, Motor Spares Ltd **STH AUST.:** Gerard and Goodman Ltd., 196 Rundle St., Adelaide **QLD.:** A. E. Harrold, 123 Charlotte St Brisbane Messrs. Chandlers P/L., Cnr Albert and Charlotte Sts Brisbane **W. AUST:** A J Wyle P/L., 1064 Hay St., Perth. **TAS** Homecrafts P/L., 220 Elizabeth St., Hobart **N.S.W.:** United Radio Distributors P/L 175 Phillip St. Sydney Homecrafts P/L 100 Clarence St Sydney

favour one signal and reject others by the process just outlined.

But this leads to another question, which may as well be answered before we go on. How does one ensure that a circuit will tune to a particular signal? How does one determine a suitable value of inductance and capacitance? The answer is simple enough.

No one combination of inductor and capacitor will tune to all possible signal frequencies. Any given combination will only tune over a certain band of frequencies which, in practice, seldom exceeds a ratio of 4:1. That is to say, the highest frequency to which a circuit will tune is seldom more than four times the lowest frequency.

TUNING BAND

This being so, it is usual to select values of inductance and capacitance in a receiver such that they will tune over that band of frequencies which includes the stations we most want to hear.

By way of example, ordinary "medium wave" broadcast stations throughout the world occupy the frequency band between about 550 and 1600 Kc, a ratio of just under 3:1. It is thus possible to tune over the entire broadcast band with a combination of one suitable inductor and one variable capacitor.

If it is desired to tune to short-wave (that is, higher frequency) signals, a new inductor must be substituted, to work with the variable capacitor.

By more or less common consent and practice, most capacitors intended for ordinary radio receivers have a maximum capacitance of about 425pF (picofarads or micromicrofarads) and a minimum of about 15pF.

The inductance of tuning coils is also fairly standardised, although less frequently quoted. The would-be constructor need only ask for a particular type of "broadcast" soil to be fully understood.

For many simple home-made receivers, the coils can be home-wound, and the question arises as to how the constructor can secure the right order of inductance in such a coil.

Again the answer is simple enough.

Where a home-wound coil is intended, instructions are normally given as to the diameter of the former to be used, the gauge and type of wire, the method of winding and the number of turns. Provided the instructions are correct—as they should be—and are followed, the resulting coil must have the right order of inductance.

MODULATION

And, if it is associated with a tuning capacitor having the appropriate minimum and maximum capacitance figures, it is more or less inevitable that the combination will tune across the appropriate band of frequencies.

So, then, we have traced the wanted signal from the transmitter and transmitting aerial, through space to the receiving aerial, and thence into a tuned circuit which selects it and rejects others which may be present.

If the original signal is modulated, varying in strength at an audio rate, then it is reasonable to assume that the strength of oscillation induced in the tuned receiving circuit will vary in the same way. In other words, we should be able to find across the tuned circuit a modulated high frequency signal, as in figure 4a. You may recognise it as portion of figure 7 from last month.

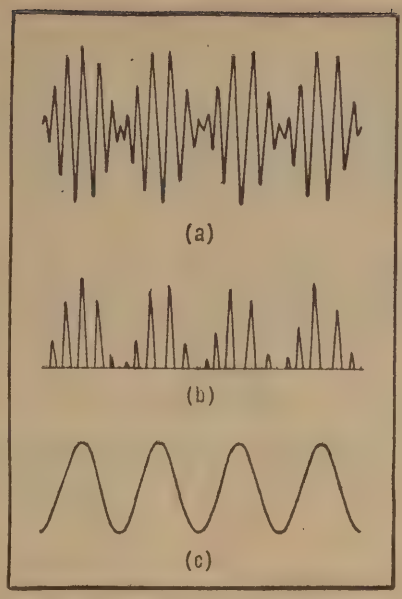


Figure 4: Sketch (a) illustrates the signal present in the tuned circuit of a receiver. Sketch (b) illustrates the action of a detector on the signal and (c) the audio component which is ultimately heard.

(For present purposes we shall ignore frequency modulation, because it is not used on the broadcast band and is not involved in the simple receivers we are at present discussing.)

Despite the fact that the wanted signal has been received and selected it cannot be heard directly, even with the aid of earphones or a loudspeaker. Let's digress for a moment to see how a simple earphone operates. The principles are illustrated in figure 5.

Inside the earphone is a permanent magnet, which may take a variety of shapes. From each pole of the magnet two soft-iron bars, or pole tips, extend forward toward a metal diaphragm.

The diaphragm cannot touch the pole tips because it is held slightly away from them by the way it is mounted. However, it is attracted strongly to the pole tips and in consequence tends to bow slightly inward toward them.

Around each pole tip is a coil of fine wire, the two coils being connected usually in series and phased so that they will supplement each other in their total effect.

When a current is passed through the coils in one direction the magnetic field so created adds to the field from the permanent magnet and the diaphragm is

BOOKS!!

RADIO — TV — ELECTRONICS

TELEVISION TEST EQUIPMENT describes the construction, calibration and use of a number of instruments designed for the TV service engineers, experimenter and amateur .. .. **Price 7/6.**
TELEVISION FAULTS by N. Stevens. Copiously illustrated with pictures of faults photographed from the screens of TV receivers. .. .. **Price 7/6.**
AMPLIFIERS by N. H. Crowhurst, M.I.R.E., A.M.I.E.E. Distortion, instability, gain, hum, trouble tracing, feedback, design are all covered from an elementary stage to an advanced stage. A splendid book. .. .. Price 5/3.
RADIO AMATEUR OPERATOR'S HANDBOOK (1957). This is the first time this book has been advertised in Australia. Essential to the shortwave enthusiast. (See commentary on page 101, June issue R. and H.) .. .. **Price 4/6**
TAPE AND WIRE RECORDING is a practical book, well worth having. .. .. **Price 4/6.**
ELECTRONIC NOVELTIES for the constructor. This book, first published last year, has been found a very good seller, and includes details for constructing a light beam communicator, a pocket receiver, a transistorised model control system for short ranges, electronics on the model railway, a burglar beater, a home TV system (closed circuit) and photoelectric ideas and novelties. .. .. .. **Price 7/6**
THE OSCILLOSCOPE BOOK is a particularly pleasing work dealing with the uses and construction (full details given) of this type of instrument. .. .. **Price 7/6.**

RADIO CONTROL OF MODELS

RADIO CONTROL OF MODEL BOATS, SHIPS and AIRCRAFT, by F. C. Judd. G2BCX. .. .. **Price 12/9.**
RADIO CONTROL OF MODELS, by G. Sommerhoff, M.A. .. .. **Price 7/6.**
A NEW BOOK, "RADIO CONTROL MECHANISMS." For the first time in Australia and New Zealand, a specialised work on this subject. .. .. **Price 6/9.**

Two books on television which are being taken by universities, Public Libraries, Technical Colleges and students throughout Australia and New Zealand
TELEVISION TIMEBASE CIRCUITS, by C. H. Banthorpe, F.T.S. .. .. **Price 7/6.**
TELEVISION SYNCHRONISING SEPARATORS, by G. N. Patchett, B.Sc., Ph.D., etc. **Price 7/6.**
PRACTICAL TV AERIAL MANUAL, our best seller in 1956, now out in a brand-new Edition. By well-known English engineer, R. Laidlaw .. .. **Price 7/6.**
TELEVISION CIRCUIT REFINEMENTS, by C. H. Banthorpe, F.T.S. .. .. **Price 7/6.**
SUPPRESSING RADIO and TV INTERFERENCE. .. .. **Price 7/6.**
TV PREAMPLIFIERS FOR BANDS I and III, of help if you live on the "fringe." .. .. **Price 7/6.**
UNIT CONSTRUCTED TV RECEIVERS, by E. N. Bradley. .. .. **Price 8/9.**

RADIO SERVICING

This series goes from the bare elements to an advanced stage with the availability of Vol. 3 "Final Radio Theory" later this year.
All of the series (as well as the forthcoming "TV SERVICING" series) are by Dr. G. N. Patchett Head of the Department of Electrical Engineering at the Bradford Technical College.
Vol. I: Basic Radio Electrotechnology. **Price 7/6;** Vol. II: Intermediate Radio Theory. **Price 7/6;** Supplementary Volume: Fault Finding **Price 7/6.**

Coming — "An electronic organ for home construction." Now at press.

DON'T BE DECEIVED BY THE LOW PRICES OF THESE BOOKS . . . They are written by leaders in the electronics field, and some, for example the "Radio Servicing" series, are used by Technical Colleges. The reason for the low price is that they are 'popular' — printed in thousands with an assured sale — and are not cloth bound.

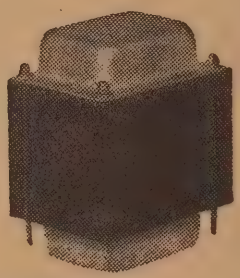
ELECTRONICS PUBLICATIONS (AUSTRALIA)

11 Cadow Street, Pymble, N.S.W.

(A Division of The Electronic Organ Company (Australia).)

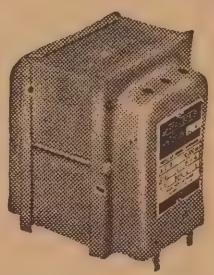
FERGUSON

TRANSFORMERS and CHOKES
FOR
EVERY REQUIREMENT



- TELEVISION RECEIVERS
- RADIO RECEIVERS
- RADIOGRAMS
- CAR RADIOS
- P.A. AMPLIFIERS
- HI-FI AMPLIFIERS
- COMMUNICATION EQUIPMENT
- TRANSMITTERS
- MODULATORS
- TEST EQUIPMENT
- BATTERY CHARGERS
- FLUORESCENT LIGHTING

ETC., ETC.



● QUALITY ● ECONOMY ● PERFORMANCE ● RELIABILITY ● UNIFORMITY

FERGUSON

Available from leading suppliers throughout Australia

INTERSTATE AGENTS:

MELBOURNE — McKINNON NICHOLLS PTY. LTD., 468 COLLINS ST. MB1501
ADELAIDE — L. W. & L. F. TYQUIN, 11 PITT ST. LA4075
BRISBANE — KEITH PERCY & CO. PTY. LTD., 179 ELIZABETH ST. B1757
PERTH — ATHOL M. HILL, 842 HAY ST. B6500

MANUFACTURED BY

FERGUSON TRANSFORMERS PTY. LTD.

FERGUSON LANE, CHATSWOOD, N.S.W. JA8491

drawn closer to the pole tips. Reversing the current through the coils causes their field to cancel that from the magnet and tension on the diaphragm is reduced.

If an alternating current is passed through the windings the tendency is for the diaphragm to vibrate to and fro. The movement is very slight, to be sure, but it is enough to set the adjacent air in motion and if a pair of phones are clamped to the ears the vibrating air actuates the eardrums to produce the sensation of sound.

Now let's go back to figure 4. If the alternating high frequency signal (a) from

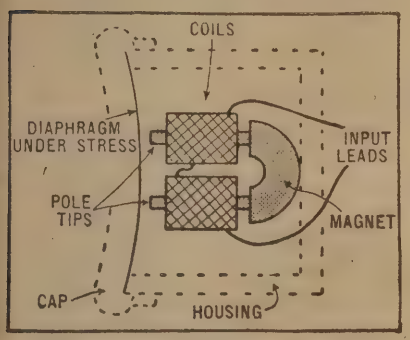


Figure 5: This diagram illustrates the principles of a simple earphone Normally, two earphones are used, one for each ear.

the tuned circuit is applied directly to the phones no sound will be heard. The reason is not hard to discover:

An upward swing of the current through the phones is followed an instant later by a downward swing. With a radio frequency input signal the alternation is so fast that the diaphragm cannot follow either, so it merely remains in its initial position. Nor does the presence of modulation make any difference, because each greater or lesser increase in current is followed and cancelled in its effect by an equivalent decrease in current.

Even if the diaphragm could follow these rapid alternations our ears would not be able to do so and we would be no better off.

THE DETECTOR

The impasse is overcome by introducing a very special component called a DETECTOR. One form of detector, a diode valve, has already been explained in Chapter 6 of this series. For our present purpose there is a more handy type, known as a CRYSTAL DETECTOR.

This has varied in form from a rather bulky device, seen on the front panel of the set in figure 1, to the modern version, which is about half an inch long and about an eighth of an inch in diameter.

The physics and chemistry behind a crystal detector are very involved, but they add up to a property which resembles that of a diode valve: crystal detectors will pass current in one direction only.

In practice a crystal detector is wired in series with one of the leads connecting the phones to the tuned circuit. This has the immediate effect illustrated in figure 4b. Instead of all the signal being passed through the phones only half the signal gets through. The other half is blocked, because it involves current which wants to go in the direction in which the crystal will not carry it.

Thus, after DETECTION, the signal which reaches the phones has the form illustrated in 4b. It still contains a high frequency component but with a difference: each of the pulses which remain represents stronger or weaker pulses of the one polarity; there are no reverse pulses to cancel them.

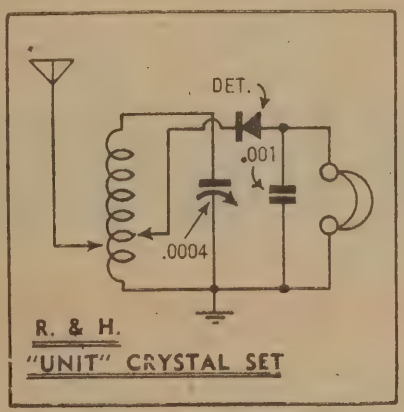


Figure 6: Here is the complete circuit for a crystal receiver. Note the aerial and earth, the tuned circuit, the detector and the phones—all components discussed in the text.

Each brief pulse tends to draw the diaphragm closer to the pole tips or, alternatively, to relieve the tension on it, according to which way around things happen to be connected. The diaphragm will not reproduce any single pulse but the accumulative effect of many successive pulses, all having the same influence, will cause the diaphragm to move.

If the input signal is modulated, as in figure 4b, the accumulative effect of all the tiny impulses likewise varies and the diaphragm tends to follow the average amplitude of the incoming signal. Its movement therefore resembles figures, &c., which is in fact the original sound content of the transmitted signal.

Put the phones on and the oscillations of the diaphragm are heard as sound. The process is complete.

Figure 6 shows the circuit of a complete crystal receiver, illustrating and based on the foregoing discussion. It is the simplest type of receiver. It merely intercepts the incoming signal and makes it audible

(To be continued)

Miniature Parts Made Bizmac

(Continued from page 7)

This occurrence within the material is comparable to the movement of electrons from the cathode to the anode in the electron tube. Furthermore, as in the transistor, it is possible with the application of a weak voltage across an area between the two extremities within the crystal to achieve effects like those produced by the grid in a vacuum tube.

These discoveries and their application represent a long step toward miniaturisation on a grand scale. Compressing within a small crystal the basic functions previously handled by electron tubes represents a reduction of perhaps over 100-fold in space occupied. But, equally important, the amount of power required to perform these functions within a solid is many times less than the total needed to heat a cathode to the "boiling" point in an electron tube.

In the tiny solid device, the transistor a small crystal serves as the environment for the precisely controlled movement of electrons to perform a number of oscillating, amplifying and detecting tasks previously handled only by electron tubes.

Many of our present examples of electronic miniaturisation are based on the use of transistors, whose small appetite for power and simple circuitry permit further reduction in the size of equipment in which they are employed. Another important point is that the transistor does not generate or require undue quantities of heat that must be carried away.

The New Armstrong Mark II Has Everything!

10 watt ultra-linear circuit using EL34s in push-pull —more power.

Features:—

Audio Filter 6 position
4 Gramo inputs
Bass and Treble controls
Equalizer switch 6 position
Power rating 10w. Peak 20w.

£84-10-0 COMPLETE

or purchase on easy terms on £24/10/- deposit and £1/8/- per week.

Hear the new Armstrong at our Audition Room; 35 Lewis St., Balgowlah

AMPLASOUND CO.

CITY OFFICE:
126 Buckingham St., Sydney
PHONE X.4193

RADIO ENGINEER WANTED

. to take charge of factory, knowledge of design and production high fidelity equipment necessary. Experience with Tape Recorders desirable Good conditions, excellent salary for right man.

Apply in confidence, with details of experience, to **Audio Engineers Pty. Ltd., Box 2776, G.P.O., Sydney.**

Let's Buy An Argument

This is a story of how NOT to sell a television receiver. I tell it in the hope it might discourage similar occurences or engender some tolerance and understanding where they do occur.

by Neville Williams

THIS story is not a fabrication, nor was it told to me by a third person I saw it happen, personally.

A middle-aged couple had been most impressed by an evening spent around a neighbour's television set. Back at home, that night, they decided to arrange for a demonstration with a view to buying a set for themselves.

This is where I came into the picture. Because I was supposed to know "all about radio," they came seeking advice about the best type of set to buy and the most suitable size of screen.

NO OPINION

On the first question, I didn't profess to have an opinion, because it would presuppose a knowledge of the circuits and techniques used by the various manufacturers.

This I couldn't claim, nor did I have any first-hand knowledge of the reliability of various brands and models. If you want information on this score, the best people to ask are those selling all brands and models. They soon get to know, by bitter experience, the sets that are awkward or critical or constantly in need of service.

On the matter of screen size, there was opportunity to be more helpful. The viewing room was really only large enough to warrant a 17in screen but, since their eyesight was growing a little hazy with age, I thought they might appreciate the larger picture given by a 21in set.

Why not visit the store of their choice first, while afternoon programs were on and try to satisfy themselves on this important point?

This they did, duly selecting a set for home demonstration which suited their taste and circumstances. It was promised for the following weekend.

Now the store in question belongs to a well-known retail organisation, about whose integrity I have no reservation. True to their word, the set was delivered on the Friday afternoon, with the invitation to keep it for a few days to make sure that it was, in fact, what they wanted.

During Saturday, I got a message to the effect that the set had turned up and "would I like to pop along and have a look at it?"

By the time I arrived, that evening, they had settled down to watch the programs, but, immediately, I could see that some of their former enthusiasm had waned.

"Try it. See what you think of it."

It was on Channel 7 and giving a picture that was literally crawling with "noise." Twiddling the knobs made little difference.

I tried Channel 9, only to find even more noise and less picture.

Channel 2? Just noise, with the vaguest suggestion of a picture in the background.

INDOOR AERIAL

The reason was not hard to see, the aerial being an indoor gadget perched on top of the cabinet. By fiddling with it, I managed to improve Channels 7 and 9 somewhat but they still weren't good. Channel 2 remained hopeless.

As a matter of fact, quite apart from the noise problem, I wasn't happy about the picture itself. Detail seemed to be lacking and the whole effect was a far cry from the 17in job you've seen described elsewhere in the mag.

Being a little "canny" I hedged a bit on this aspect and suggested that one really couldn't judge a set with such a poor aerial. Why not ask for a more effective demonstration?

At this they remembered that the installation mechanic had said that he would rig up a temporary outdoor aerial, "if it proved to be necessary."

As far as I could see, there should never have been any doubt about it.

The only doubt now, it seemed, was on the part of the couple concerned — whether television was really worth all that money!

NEW AERIAL

Early next week, I was told that the outdoor aerial had been put up. Could I possibly have another look at the set?

Such is the role of a friend.

When I walked in that evening, the atmosphere was decidedly frigid.

I rather gathered that Mrs. had upbraided Mr. for not listening to what the man had said about tuning the receiver. Mr. had reminded Mrs. that the Instruction Book was there and "she was perfectly free to try the knobs for herself!"

Apparently — and this didn't help any — the lady from next door was due in for the evening and the bell would ring at any moment.

I checked the set again. This time

it was hard to say which station was the worst; they were all so poor.

After a few moments fiddling, and acting on an inspiration I reached around the back and wiggled the aerial lead. There was a flicker and a flash and the pictures were there, hard and black.

Whoever had "connected" the aerial had done so with the aid of two halves of a broken match. The end of the wires had merely been bared for a half-inch, then jammed into the holes as aforesaid.

EMERGENCY MEASURE

Since I don't normally carry tip-jacks and a soldering iron in my pocket, I could do no more than bare rather more of the wire, spiral it around the match and push it back in place. But, at least, it would not be so easily dislodged as before.

Reappearance of the picture restored a measure of harmony all around, for which I was duly thankful. I was equally pleased to note that the picture now exhibited the normal amount of detail — something that had been lost before in the confusion of noise and ghost images.

As I write, I gather that the folk concerned intend to buy the set but IN SPITE OF the demonstration, not because of it!

In case you think this to be an isolated instance, let me quote a further story related to me by a member of our staff.

A relative of his, living in an outer suburb, had been toying with the idea of buying a television set ever since the stations got under way. He wanted a set all right, but it was just a matter of whether to buy it immediately or devote his next time-payment venture to one or other of the things he needed around the home.

Thanks to program publicity and such like, the idea of buying the television set gained ground and as much was mentioned to the local radio dealer.

SET FOR TRIAL

Next thing he knew, the man in question found the dealer on his doorstep complete with a television receiver and demonstration aerial. The dealer explained that he was in a "tearing hurry" to get away for the long weekend but he had a set to spare and our friend might just as well have the benefit of it, without obligation, for the next three or four days.

"Just stick up the aerial somewhere," the dealer said, "connect the wires here and it should go.

"You might have to twiddle the knobs a bit but you'll soon find out how they work.

"Got to rush, now. See you later."

Following instructions, the prospective buyer "stuck up the aerial," connected the wires and waited for a picture to appear.

Ten minutes later, he was still valiantly twiddling knobs, getting pictures that jerked and rolled in the most erratic fashion, sometimes black, sometimes misty. Even when he did seem to get things sorted out, the results weren't good.

The man and his wife watched the weekend's programs with difficulty but, by the time the retailer called again, they had fully made up their minds that they could really do without television for a couple of years yet. After all, they did need this and they did need that!

Checking up on the story later, our staff member was staggered to find that the receiver loaned for demonstration had a suspected intermittent fault—otherwise it wouldn't have been available at all. The retailer had loaned it, not with the idea of selling it but simply as a gesture which would lead to a formal demonstration later, when requested.

Unless conditions change drastically he request will be much, much later

Now I well know that selling television sets is quite a chore. You can't wrap them up like an iron or a toaster and see them carried out the door, never to return. You can't even sell them like mantel radios, more or less on eye appeal in the shop

Customers insist on a home demonstration and, if they don't like the colour or styling of the first set, they expect another to be brought in its place. If they're going to spend two or three hundred pounds, they're determined to get their money's worth.

REAL PROBLEM

The retailer has to bear the brunt of this indecision. He has to employ technical men husky enough to carry television sets up stairs and down stairs. He has to provide vehicles which will do justice to his business and protect their costly cargo.

Perhaps we can't blame him for not wanting to be too precise about the demonstration setup, particularly if he knows that a proportion of his prospective "customers" are only using his service to get a free picture show for a few nights.

But can he afford to be other than meticulous? In the cases I've quoted, both couples were genuine customers and sales were either lost or nearly lost by sheer carelessness.

It's not just enough to explain to customers that reception will be a lot better when the set is properly installed, when they've paid up for an efficient aerial. Some of the customers will believe the story, the others merely use it as an excuse for not making up their mind.

BETTER PRACTICE?

In the long run, it may be better business to give fewer but thorough demonstrations, with a high percentage of completed sales, than to follow the reverse procedure. I know of one firm which is currently adopting the policy of not giving demonstrations unless the customer accepts the principle of having an adequate aerial erected temporarily for demonstration, to be made permanent if the deal is closed.

Their view is that such a policy discourages "customers" who are merely after the free show. It minimises the risk of dissatisfaction with the preferred receiver and therefore the inclination to swap it for another brand. And, last but not least, it minimises the complaints and ill-will which can easily arise from weak signals and ghost troubles due to inadequate indoor aerials.

Does all this cancel what I had to say recently about the use of unduly elaborate aerials?

Not a bit of it.

There's no more sense in buying and installing a fringe-type aerial close to the station than there is in expecting a receiver to give its best with a ghost-ridden signal, way down in the noise.

Still on the subject of television, the remarks some issues back about television advertising, were apparently appreciated by technical readers at least. I can't

IDEAS FOR T.V. ADVERTS.—FREE!

If the sale of television receivers is going to be boosted by coining phrases and featuring the obvious, why be modest? Here's a few to sprinkle through the adverts . . . . ,

SUPER-FLATTE PICTURE—Banishes line structure and superfluous detail. The picture always looks the same, whether your eyes are good or bad.

CARTOON-A-MATIC CONTRAST CONTROL—Allows you to see your picture in normal half-tone or in black-and-white.

FULL FLOATING TIME BASES—Virtually unsynchable!

AUTO-SYNCHOMATIC SOUND CHANNEL—Sound remains fully synchronised with the picture on live studio programs.

MORSE-CODE LINE STRUCTURE—Named after famous radio pioneer, this novel circuit feature uses interaction of sound and picture carriers to break all scanning lines into dashed dots.

ANTI-SNOW CIRCUIT—A 6.3-volt heater in the kinescope melts the snow out of your picture, like magic.

EXCLUSIVE "CYCLE-CHEK" FEATURE—A quick glance at the hum bars in the picture will tell you at any time whether or not the power mains are on frequency.

OPTI-RHYTHMATIC SOUND SYSTEM—Turn up the volume on any "pop" music and the picture pulsates like magic in the tempo of the bass drum.

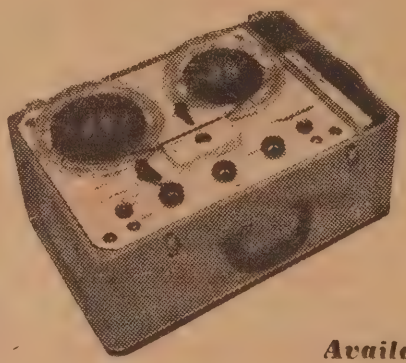
CONTORTOMATIC PICTURE—Makes even dull programs funny to watch. Always good for a laugh! Characters grimace automatically as they move around screen.

SENSATIONAL NEW "CISSY" AERIAL—Not just useful on television. Will receive also Hi-Fi VHF broadcasts. "Cissy" is the only possible name for the new aerial—it gets F-M-in-it!

PYROX *Magictape*

FIRST CHOICE FOR RELIABILITY!

Suppliers of recording equipment say that Pyrox Magictape is automatically first choice when a recorder is needed for reliable operation where no service facilities are available. Pyrox will give you, too, absolute lowest maintenance and long, long hours of trouble-free high fidelity recording.



Controls are simple—one speed for both speech and music, fast forward and rewind, 2 hours high fidelity on each spool of tape.

Available music and radio Stores everywhere

PYROX LTD.

14-36 Queensberry St., Melbourne FJ9121
69-71 Edward St., Pyrmont, N.S.W MW4417

ZEPHYR

"65" SERIES DYNAMIC MICROPHONES

- Australian manufacture throughout
- Robust Moving Coil Generator
- Cable securely held and protected at point of entry
- Frequency range 50-9000 CPS.
- Output level—50DB (Odb= 1 Volt/dyne/Cm²)
- Made for Australian conditions
- Diaphragm not affected by temperature changes
- All metal case, in pleasing durable finish (Black & Gold).
- Impedance
  Model 65 MA Grid
  Model 65 MD 50 ohms.
- Suitable for Tape Recorders, P.A Work, Speechcraft, Lecture use etc.

PRICE

65MA £10/17/10
65MD £7/19/10
(Retail including sales tax)

STOCKED BY LEADING WHOLESALERS IN EACH STATE

If unable to obtain from your dealer write direct to:—

ZEPHYR PRODUCTS PTY. LTD.

Phone 8L1300

58 HIGH STREET, GLEN IRIS SE6, VICTORIA.

AGENTS:

N.S.W Jacoby Mitchell & Co Pty. Ltd 481 Kent St Sydney, NSW

W.A.: D. K Northover & Co. 115 Murray Street Perth, W Aust

S.A. Neil Muller Ltd. 8 Arthur Street Unley, Sth Aust

claim, however, that the fanciful phrases have been dropped from adverts. as a result.

On the contrary, a few more "gems" have found their way into the said television adverts.

Most lustrous of them all and the one to which I must award the prize, was the ad. which stated that a certain new model T.V. receiver had a frequency modulated sound channel. It wasn't claimed as an exclusive feature, to be sure, but it was described in such glowing terms that the uninitiated must surely have assumed that this was something really new, almost exclusive.

If ever I find myself selling Holdens to the natives of New Guinea, I must remember to make great capital of the fact that they have four wheels!

That will really slay the competitors.

So much for that.

MORE T.V.!

Though I made a valiant effort to get away from television last month, in these columns, it is difficult to do so.

It must be very frustrating for readers in other States to have to view all these activities from afar. Let's hope, from a technical standpoint, anyway, that it won't be too long before the allotted channels are vibrant with life in other centres of population.

From a reader in Coburg, Victoria, comes a letter disagreeing with the oft-repeated advice to view television in subdued light rather than in complete darkness. He says:

"Many people, opticians, doctors, T.V. set salesmen and, I suppose, some members of the staff of RT & H believe that T.V. sets should have filter glasses and/or should be viewed in conditions of medium ambient lighting.

"I do not.

"I believe that most of these types of people have been led astray by others more interested in pandering to an ignorant public than to the ocular health of the said public.

"To have medium ambient lighting shining into the eyes causes eyestrain.

"To have objects in the room illuminated causes mental distraction and thus strain.

"TV should be viewed in complete darkness.

"It is better to have some inconvenience when passing from a darkened room to a lighted room than to sit for hour after hour in bad conditions.

"The inconvenience could be lessened by using sun glasses while the eyes are adapting themselves to the lighted room."

Yours faithfully, M.G.

Thanks M.G., for your letter. I like your style, brief and to the point.

I like the way you assert your views. It's good for argument.

BUT WHY?

What has me puzzled is the reason for the said views. Are they the outcome of reasonable viewing experience? Do you speak as one having more than a passing knowledge of the human eye? Have you a "chip on your shoulder?" Are you trying to start a witch-hunt?

Whatever the explanation, I might as well say straight out that I don't agree with your contentions, nor do I follow them in practice. I just like to watch television (when I can find the time) under medium light conditions.

The thought of stumbling around in a blacked-out room or screaming at someone who opens a door or strikes a match, leaves me completely cold.

And as for sun glasses . . . well!

M.G.'s bracketing together of ambient light conditions and the provision of filter-type safety screens is valid, if not immediately obvious.

Picture tubes have a glass face backed by a whitish phosphor, backed again in most cases by a microscopically thin layer of aluminium. They act, therefore, . . tolerable reflectors of incident light.

With no image on the screen, the face of a television tube therefore assumes a mid-grey tone in a partly-lit room. Presented under such conditions, a picture cannot exploit the full range of tones from black to white but is confined to the range mid-grey to white.

The reason is obvious enough. While an electron beam can activate the screen to produce highlights, the "black" areas are produced simply by cutting off the beam current. There is no way, electronically, of making sections of the screen darker than they really are.

If one can interpolate a thought here, this statement may well be contested on the grounds that it doesn't seem to work that way in practice. The blacks in a picture usually look a lot darker than what one would expect from a preliminary inspection of the screen. How come?

You can thank your eyes for this effect. In a partly lit room, the eyes automatically set themselves to a "wide aperture," to use a photographic term, in order to collect as much light information as they can. Under these conditions the screen looks a definite mid grey.

The moment you turn on the picture and look at it, your eyes reduce aperture to cope with the extra light and the effect of the ambient light on the screen diminishes in proportion. The "blacks," therefore, appear a lot darker than you might have imagined possible.

Another important point relates to the colour of the ambient light. Most television pictures tend to the blue end of the spectrum. It is surprising how much ambient light you can "see through" if that light comes from incandescent globes in traditional "autumn tone" light shades, favouring the red end.

FULL LIGHTING

Where you just want a picture, without worrying about the finer points, it is entirely possible to watch it against full overhead room illumination under these conditions.

The idea of tilting the safety glass and picture face slightly forward at the top is also helpful, because it reduces the amount of incident light from overhead and minimises risk of reflection from other lights at intermediate levels.

But the use of light-absorbent safety glass is the best known aid to viewing in moderately lit rooms. It does not reduce the brightness of the picture, as far as the viewer is concerned, because he compensates by turning up the brightness control by the appropriate amount.

(Continued on page 121)

RULES FOR VIEWING TELEVISION

The following rules for comfortable television viewing have been originated by the British Institute of Ophthalmology. Do you agree or disagree?

- Sit at the right distance from the screen.—Not less than 6 feet and up to 15 feet for a 17-inch screen, and not less than 10 feet and up to 20 feet for a 21-inch screen. Suit the size of the screen to the size of your room.
- Have your set at the right height. Sit in a comfortable chair, in which you can relax, so that the screen centre is about eye-level.
- Do not sit too far to the side—not more than 40 degrees from the centre line.
- Place the set so that reflections of windows, artificial lights or the fire do not appear on the screen.
- Avoid glare, but do not view in total darkness. The contrast between the bright screen and a dark background leads to a glare condition.
- Keep your set properly tuned and maintained. Unsteady or ill-defined pictures tire the eyes.

ANOTHER UNSOLVED MYSTERY!

Remember the riddle of the post-synch. pulses? Who can forget it?

Well here's another one.

A few months ago, a newspaper story from England told how certain experimental television transmissions caused a large proportion of the viewing audience to observe an overall tint in the reproduced picture. Interviews with typical viewers were quoted. Some saw one tint, some another.

Some saw nothing unusual.

We've waited in vain, since, for an explanation of what it was all about.

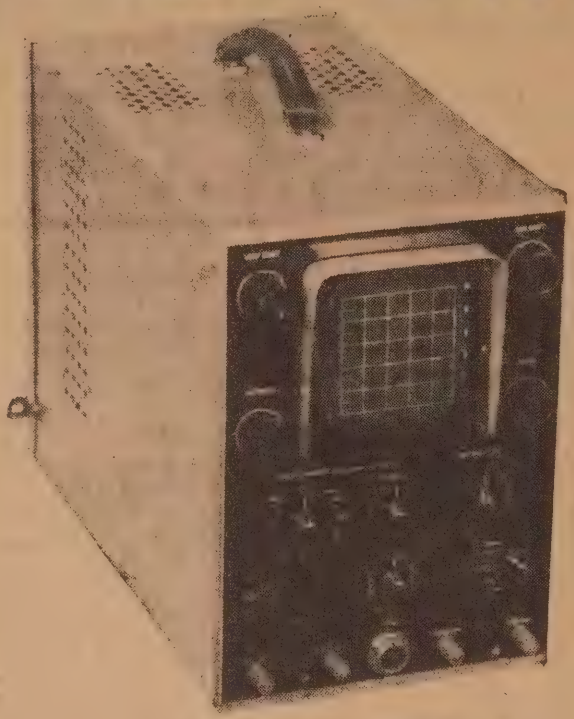
Was it some scheme which a "back-room boy" had thought up in an effort to overhaul American leadership in colour TV?

Had 70 per cent of the viewers been tippling that evening to the point where they could be made to see anything?

Was the whole thing a hoax and, if so, on whose part?

Was it an attempt to start a new legend as a mate for the Loch Ness monster?

5 inch OSCILLOSCOPE



- **FREQUENCY RESPONSE:**—(-Y AMP) less than 1 cycle to 3.5MCS (−3DB).
- **SENSITIVITY:**—Stepped attenuator giving full pattern height with inputs from 500MV to 1000V in 12 steps.
- **TIME BASE FREQ.:**—10 cycles to 100KCS in 4 ranges with fine control.
- +VE or −VE peak SYNC from vertical AMP. or external.
- Provision for low capacitance probe input.
- Calibrating graticule.
- 11 Valves in all.
- Low loss sockets.
- Black anodized front panel.
- Triggered time base if required at extra cost.

PRICE INCLUDING TAX £78/15/-

MIRROFONE ELECTRONICS

403 NEW CANTERBURY ROAD, DULWICH HILL, N.S.W. PHONE LM1554

DELYSÉ
RECORDS

Ibbott

Complete Audio Equipment.
430 Bourke St., Melbourne. MU5032

WELSH MUSIC ON RECORD

Ibbott Audio equipment are pleased to announce that they have the rights to and are issuing in Australia, two records of Welsh Music under the Delysé label.

E.C.3133 Welsh Folk Music
E.C.3137 Music of the Welsh Mountains

These records have been widely acclaimed in England and will appeal also to non-Welsh members of the community.

New Zealand: Fred Rothschild & Sons,
79-83 Pretoria St., Lower Hutt.

TESTING WITH SQUARE WAVES

Square-wave testing is a technique which is being widely used to-day for wide-band amplifiers including video amplifiers. Used with a good oscilloscope the square wave generator provides much information speedily and conveniently

By E. G. LOUIS

BY means of a Fourier analysis it is possible to show that an "ideal" square wave, Fig. 1 (Curve 1) consists of a fundamental (Curve 2) sine wave whose frequency is equal to that of the square wave, together with the third (Curve 3), fifth, seventh, ninth and higher odd harmonics, the amplitude of each decreasing in direct proportion to its order. Theoretically, a perfect square wave consists of a fundamental together with an infinite number of higher odd harmonic signals.

If such a square-wave signal is applied to the input of an electrical circuit, whether a filter network, amplifier, or other system, and the system does not respond equally well to the fundamental and all higher harmonics, then the output signal obtained will be distorted in a fashion indicative of the response characteristics of the system under test. This is the basis of the square-wave test technique.

RAPID METHOD

Since not only the fundamental but all higher harmonics are applied simultaneously, and an indication of the system's response to this wide range of signals is obtained at once, square-wave testing provides an extremely rapid method for checking such network characteristics as frequency response, phase shift, transient response, etc.

Because of the speed with which the square-wave test technique can be applied and information obtained, this method becomes quite valuable not only as an aid in the production testing and servicing of electronic equipment, but can be applied with equal, if not greater value to the requirements of the practical design engineer.

In the past the technique of square wave testing has been confined largely to testing high-fidelity audio amplifiers and wide-band amplifiers with a bandwidth of perhaps several hundred kilocycles or one megacycle.

VIDEO USE

With wide-band oscilloscopes now commercially available at prices within the reach of even the moderate-sized experimental laboratory, and with square wave generators on the market delivering square waves with fast rise times to frequencies as high as one megacycle, this valuable and easily applied technique can be applied to a very much greater extent.

It may be used for checking not only audio amplifiers, transformers, and similar systems but also for the check and design of wide-band scope and radar amplifiers, video amplifiers and similar wide-frequency-range networks.

Since the techniques of square-wave testing and analysis can be applied in the same fashion irrespective of the end results in view, whether servicing, design or production test, we will try to simply outline the basic technique, with the major emphasis on the application of the technique in the design and service of wide-band amplifier circuits.

Fundamentally speaking, only two pieces of equipment are required to apply the square-wave test technique, a square-wave generator and an oscilloscope.

THE EQUIPMENT

The square-wave generator may consist of a sine-wave generator and a suitable clipper amplifier where audio circuits and comparatively narrow band-circuits are to be checked. Where the response of video amplifiers and similar wide-frequency-range systems are to be checked, however, it is best to obtain a specially designed square-wave generator.

In general, the square-wave generator should deliver perfect square waves with a short rise time at frequencies from the lowest frequency response of the system to be studied to a frequency one-tenth the highest frequency response of the system.

For practical laboratory work a square-wave generator delivering signals from 50 cps to about 500 kc or one mc with a rise time of at most 1 microsecond (and preferably less) will be found suitable. These signals may be available

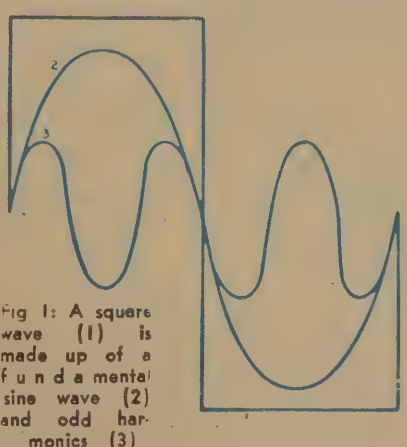


Fig 1: A square wave (1) is made up of a fundamental sine wave (2) and odd harmonics (3)

over a continuously variable range, or only at four or five "spot" values within this range. The output voltage should be easily varied from under one volt to at least eight to 10 volts. Output impedance should be low. 600 ohms is about the highest that can generally be tolerated, particularly at high frequencies.

The oscilloscope used must have characteristics that are superior to the system under test. From a general viewpoint its vertical amplifier should be flat below the lowest frequency square wave to be used in testing to a frequency 10 times higher than the highest frequency signal to be used (within one or two db).

CRO SPECIFICATIONS

It should not, in itself, cause any appreciable tilt or overshoot to any square-wave signal applied to its input within the range to be used for test purposes. The vertical amplifier should have a sensitivity of at least .5 volt/inch (peak-to-peak) and preferably more.

A linear time base should be available within the scope which permits observation (with expanded sweep if necessary) of one cycle of both the highest and lowest frequency square waves to be used in testing.

The basic setup used for square-wave testing is illustrated in block diagram form in Fig. 2. A square-wave signal is applied to the input of the system to be tested and the input and output signals observed on a cathode-ray oscilloscope. Deviations from the original square-wave shape indicate certain characteristics of the system under test.

Test leads, both to and from the equipment, should be as short as possible, otherwise, with high-frequency signals, or signals with a short rise time, unnatural peaking and overshoot may be introduced due to resonance in the connecting leads themselves.

The output signal should be observed at a point where the loading of the CRO will not appreciably affect the circuit parameters. If a high-impedance, low-capacity probe is used with the scope, then individual stage characteristics can be observed.

LIMITATIONS

Since a square wave contains only a fundamental and higher harmonics, it is not ordinarily employed for checking the response of a system at frequencies lower than its fundamental value. The exception to this is the case of a network whose response is such that the fundamental of the square wave is changed in some manner with respect to its higher frequency components. Such a condition may cause a change in the square-wave shape indicative of the system's response at lower frequencies.

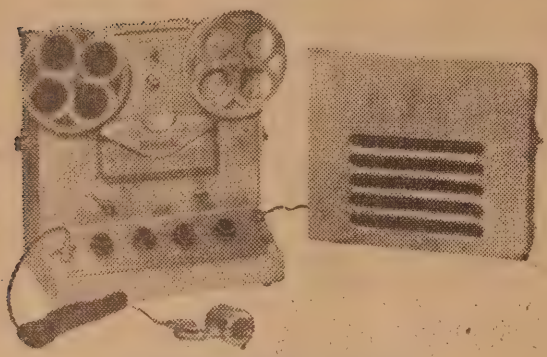
Only odd harmonics of the square wave are present as part of the entire signal hence any sharp dips or holes in the response characteristics of the system at specific frequencies falling between the odd harmonics may not show up in a square-wave test. However, the response of most amplifiers varies in a smooth manner and this limitation is minor.

In general, a square-wave test will not indicate distortion due to overload or

MAGNETIC SOUND INDUSTRIES

TAPE RECORDERS

Bargains from £65



TECNICORDA UG4

De Luxe version, upright model, semi prof., separate loudspeaker, inbuilt mixing control, 2 speeds, fast forward and rewind. Prices from £75, £85, £95, £115.

GRUNDIG Few of these luxury imported machines available from time to time—fully press-button and automatic. Some 2 speeds, some play up to 3 hours. £75 £85, £95 £115.

Tapes, microphones, reels, stands, etc.

Agfa tape 600, Special 22/6 a reel.

Pre-recorded tapes, high fidelity recordings of classical music on 1200 Westinghouse tape £2/19/- reduced from £4/17/-

Tape Place Indicators for accuracy of place on tape. For any tape recorder except Tecnicorda UG4.

Tapes E.M.I. 1200' 58/-.

Special Long Playing Tapes 1800', 79/6

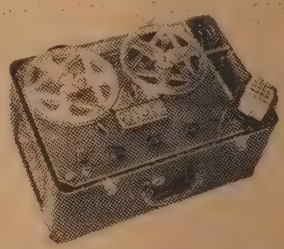
B.A.S.F. 1200' 65/-

SPECIAL Grundig HI-FI tape 1200' 65/-

Excellent CRYSTAL mikes, 59/-

EVERY TAPE RECORDER sold is complete with FREE tape and microphone, as well as a WRITTEN GUARANTEE.

ELCON 2 speeds, twin tracks, inbuilt P.A. system. Radio input. £65, £75, £85. Radiocorder records from radio to tape, etc. £85, £95, £105.



A.W.A. 1 hour recorder. Radio input extension. Speaker output, excellent reproduction of music and speech. Usually £135/8/4. Price £69, £75.

TECNICORDA UG666

New Model—Only 114 gns.

MAGNETIC SOUND INDUSTRIES (AUST.)

387 George Street, opposite the Strand Arcade. Our Daylight showrooms are on the Entire First Floor. Phone BX4440—BX4587.

overdrive on an amplifier, unless the overload distortion varies with frequency. The square wave is simply made more "square," and a sine-wave signal still must be used for such tests.

Finally, since it is almost physically impossible to produce a "perfect" square wave, and very difficult to detect changes in the square wave because of deterioration of signals higher than the tenth harmonic, square-wave signals should be available and used at approximately decade values. The exact number of signals required for a complete test will depend on the band-width of the system under test.

USEFUL FREQUENCIES

From a practical viewpoint, signals of 50 cps. and 1 kc. are suitable for testing usual amplifiers and transformers. For checking wide-band amplifiers generally used in the lab., frequencies of 50 cps., 1 kc., 10 kc., and 100 kc. may be used. For checking video amplifiers, signals of 50 cps., 1 kc., 10 kc. and 100 kc. may be used. Signals as high as 1 mc. may be used for checking special pulsing circuits.

Typical patterns that may be obtained when a low-frequency square wave is applied to an amplifier or network are shown in Fig. 4. A basic triode, resistance-coupled amplifier stage is shown in Fig. 3.

If the amplifier responds perfectly to the input square-wave signal, neither attenuating nor accentuating the higher harmonics and causing no phase shift, a perfect output square wave will be obtained which, except for amplitude, is identical with the input signal as shown in Fig. 4A.

A boost at the fundamental frequency of the square wave with respect to its higher harmonics, but with no phase shift, will result in the rounded signal shown in Fig. 4B. Conversely, a loss at the fundamental frequency will result in a general dip in the square wave as shown in Fig. 4C, while a dip in the response curve, causing a loss of a particular harmonic, will result in a dip at one or more points in the square wave as shown in Fig. 4D.

PHASE SHIFT

Leading phase shift at low frequencies, but without appreciable signal loss, displaces the fundamental with respect to the harmonics, resulting in a tilted square top as shown in Fig. 4E. This is generally due to too low time constant in the RC coupling network (Cgl-Rg in Fig. 3). If a loss of signal accompanies the phase shift, then the flat top will curve downward as well as be slanted, as shown in Fig. 4F. An extreme case of too low a time constant in the coupling network may cause differentiation of the signal, allowing only the higher harmonics to pass and resulting in a peaked signal as shown in Fig. 4G. Such a signal may also be obtained due to high-frequency leakage around an attenuator circuit.

Where low-frequency compensation is added to the amplifier stage (Rc-Cc in Fig. 3) over-compensation may result in the phase lagging at low frequencies, causing the square wave to tilt in the opposite direction as shown in Fig. 4H.

Irrespective of whether leading or lagging phase shift causes the square wave flat top to tilt (Figs. 4E or 4H), the amount of the tilt depends on the degree of phase shift. A 10 per cent. slope will

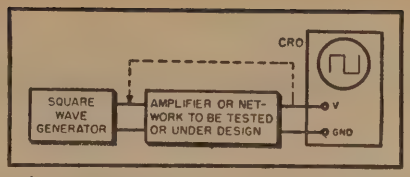


Fig. 2 Setup for square-wave tests

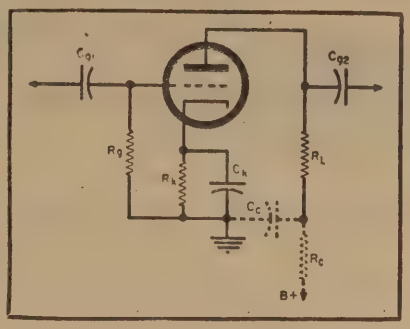


Fig. 3 Basic triode amplifier circuit

be obtained when the phase shift is two degrees at the fundamental frequency of the signal.

From a design viewpoint, conditions shown in Figs. 4E, 4F or 4G generally indicate (in Fig. 3) either that Cgl or Rg or both should be increased in value, that Ck should be made larger, or that insufficient low-frequency compensation has been added. This, in turn, means that either Cc should be made smaller or Rc should be made larger (with respect to Rl). If the condition shown in Fig. 4H is obtained, then the amount of low-frequency compensation should be lowered, by either reducing the value of Rc or increasing the value of Cc.

TILT PATTERN

From a servicing viewpoint, conditions indicated in Figs. 4E, 4F, or 4G generally indicate (again in Fig. 3) either that Cgl or Rg has become lower in value (usually Cgl will have partially opened—fully open would result in Fig. 4G; that Ck has lost capacity, that Cc has increased in capacity (unlikely) or that Rc has dropped in value (which may happen due to overload). The condition of Fig. 4H indicates, generally, that Cc has lost capacity or developed high power factor. It may also indicate that Rc has increased in value, but this is not very likely.

The response of the amplifier to both low and high frequency signals must be considered before a full analysis of circuit operation can be made. Both tests when taken together, give a much better picture of conditions in the system under test.

Circuit deficiencies at high frequencies may result in any of the patterns shown in Fig. 5 (and even in some of those shown previously, particularly as far as phase shift is concerned). A typical single-stage RC-coupled triode amplifier is shown in Fig. 7, together with some of the factors affecting its response to high frequencies.

HIGH FREQUENCIES

As in Fig. 4A, the "perfect" signal is shown in Fig. 5A. A loss of higher frequency harmonic signals will result in a rounding of the leading edge of the square wave as in Fig. 5B. The degree of rounding is dependent on loss of high frequencies, and an extreme loss will result in the output square wave approaching a sine wave in form. If almost all higher harmonics are lost the square wave may appear as in Fig. 5C.

Resonant circuits in the amplifier (or in the connecting leads) may cause "ringing" and result in damped oscillations on the leading edge of the square wave, as shown in Fig. 5D. The frequency at which the oscillations occur can be determined approximately by multiplying the number of "cycles" that would be present along the flat square top of the signal (if not damped) by twice the fundamental frequency of the square wave. Where rapid damping occurs, or where the resonant frequency is extremely high, only a small "overshoot," as shown in Fig. 5E, may be obtained.

RISE TIME

Since the rise time (time for square wave to go from 10 per cent. to 90 per cent. of its peak value) is dependent on the number of higher harmonic signals present without attenuation, this serves as a good indication of uniform frequency response of an amplifier or network, irrespective of whether rounding of the square wave occurs or not.

An increase in rise time in a square wave is shown in Fig. 6.

A simple relationship, accurate enough for most practical design work, between rise time and uniform frequency response of an amplifier, is as follows:

Maximum f (uniform response in mc.) equals $\frac{1}{2Tr}$

where Tr is the rise time in microseconds. (This relation holds true only where artificial means such

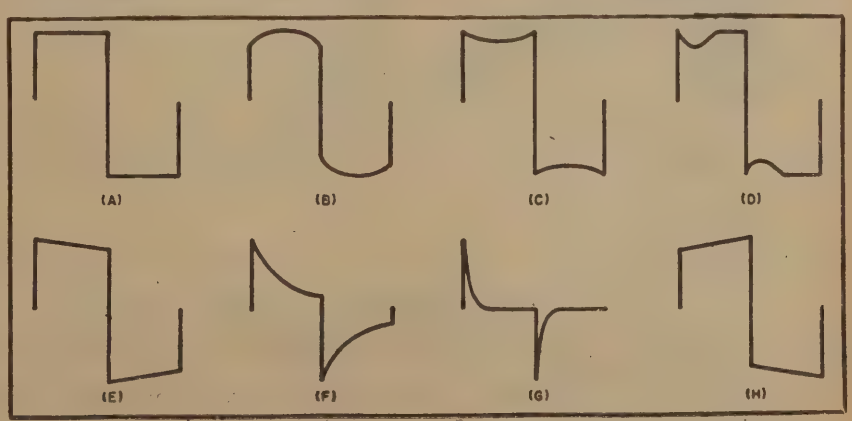
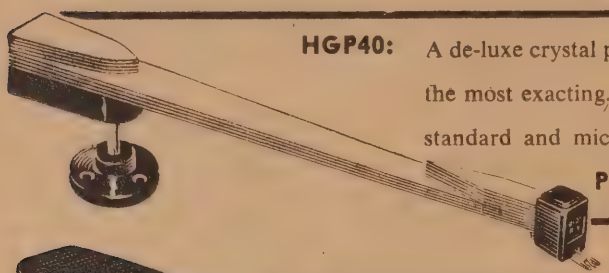


Fig. 4: Typical patterns obtained with low-frequency square-wave applied.

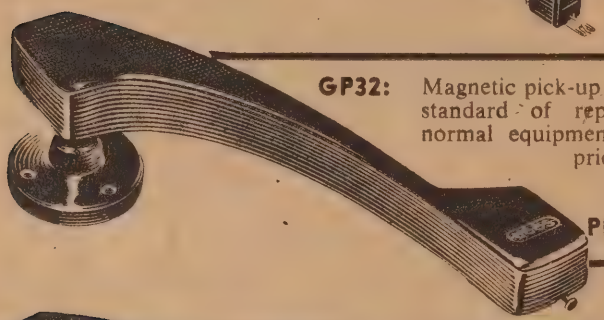
offering you the widest range of pick-ups . . .

acos

CRYSTAL MAGNETIC • CERAMIC



HGP40: A de-luxe crystal pick-up to satisfy the most exacting. Complete with standard and microgroove heads. **PRICE, £9/15/-**

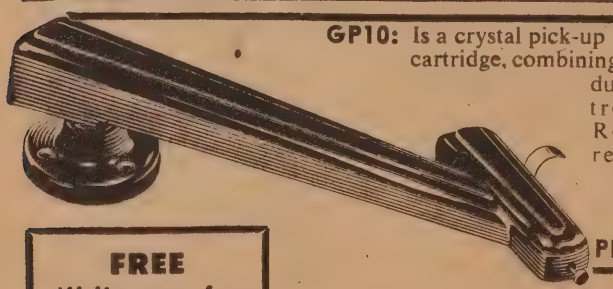


GP32: Magnetic pick-up provides a good standard of reproduction with normal equipment at reasonable price. Output voltage, ½ volt at 1,000 c.p.s. **PRICE, £2/12/6**

HGP38: A crystal pick-up. Incorporates the HGP37 turnover cartridge for standard or microgroove recordings with cantilever stylus. **PRICE, £5/15/-**

GP50: Is a HIGH-OUTPUT crystal pick-up suitable for reproducing standard and microgroove records through *low-gain* amplifiers as used in small record players and some radios **PRICE, £4/19/6**

GP60: Incorporates the latest-type CERAMIC cartridge—unaffected by heat or humidity. For use in tropical areas. **PRICE, £6/16/-**

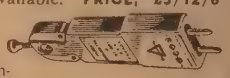


GP10: Is a crystal pick-up utilising the GP9 cartridge, combining purity of reproduction with extreme reliability. Resonance-free response from 50/8,000 c.p.s. Output, 1.5V at 1,000 c.p.s. **PRICE, £3/12/6**

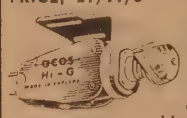
FREE
Write now for illustrated technical literature on any of the products shown on this page.

plus these acos replacement cartridges

HGP39 CARTRIDGE
Designed to meet the most exacting requirements of modern recordings — low element mass and very high compliance enables the heaviest modulation possible to be traced with a minimum of record wear. Both standard and L.P. heads available. **PRICE, £3/12/6**



GP9 CARTRIDGE
Now famous as the cartridge with the unbreakable crystal. Takes standard steel or fibre needles for 78 r.p.m. records. **PRICE, £1/11/6**



GP59 CARTRIDGE
A HIGH-OUTPUT cartridge suitable for reproducing standard and microgroove records through low-gain amplifiers. **PRICE, £2/3/-.**

CARTRIDGE GP61
A CERAMIC cartridge that will withstand the rigours of a tropical climate and is, at the same time, very robust. **PRICE, £3/19/6**

HGP37 CARTRIDGE
A TURNOVER cartridge with cantilever stylus that utilises a new method of crystal drive, a bisectional control element that achieves independent characteristics for standard and microgroove. **PRICE, £2/18/6**

Sole Agents in Australia:

AMPLION (A'SIA) PTY. LTD.

88 Parramatta Road, Camperdown, Sydney, N.S.W. Phone LA 6124

as peaking coils, are not used to shorten the rise time.)

From a design viewpoint, conditions shown in Figs. 5B or 5C indicate that the high-frequency response of an amplifier is not sufficient. This can be improved by reducing the effect of distributed capacities shown in Fig. 7 by making Rl as small as is practicable for the gain desired, and then by using series and shunt peaking coils, as shown in Fig. 8, to offset these capacities.

To obtain reasonable gain with a low Rl, it may be necessary to go to tubes having high mutual conductance. In such a case, the stage gain is equal to the product of the load resistance and tube mutual conductance.

Distributed capacities are reduced by keeping leads short, parts and leads above the chassis, and using miniature parts where economically feasible.

PEAKING COILS

The inductance of the peaking coils is generally chosen so that resonance will occur with the distributed capacities in the circuit at frequencies higher than the highest frequency at which uniform response is desired in the amplifier. In better amplifiers, these coils are usually made adjustable so that each unit may be adjusted for best response for the individual distributed capacities in that unit.

If these coils resonate at too low a frequency, or if insufficient damping (R81 and R82 in Fig. 8) is used, a severe overshoot may occur, or an oscillatory wave train may be set up, as shown in Fig. 5D.

Often a slight amount of overshoot (about 5% maximum) is desirable, as it tends to shorten the rise time of the amplifier. Thus, the condition shown in Fig. 5E would not always be considered objectionable.

SUNDRY PATTERNS

A loss of higher frequency signals may occur if there is inductance in the electrolytic capacitor used for cathode bypass (Lck in Fig. 7), due to degeneration across Rk and the loss of gain at these frequencies. In practical design this can be offset by bypassing the electrolytic with a small capacitor (around 005 mfd.), at Ck1 in Fig. 8.

From a servicing viewpoint, conditions illustrated in Figs. 5B and 5C may indicate that a peaking coil has become shorted or open (if shunted with a damping resistor) or that Rl has increased in value. In some cases it may indicate an open in Ck1 (Fig. 8).

The condition shown in Fig. 5D may seldom be encountered, but generally indicates that a damping resistor across a peaking coil has opened.

The condition of Fig. 5B, at higher frequencies, together with the condition shown in Fig. 4H at lower frequencies, would indicate that Cc (Fig. 3) has become open or dropped in capacity. Thus, it is practical to use a combination of conditions to indicate a specific defect.

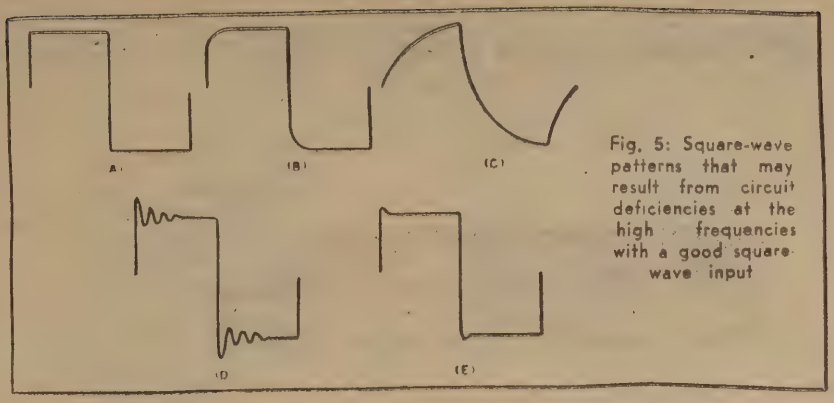


Fig. 5: Square-wave patterns that may result from circuit deficiencies at the high frequencies with a good square wave input

Square waves, observed with a cathode-ray oscilloscope, provide an efficient and extremely rapid technique for testing and servicing systems designed to pass a band of frequencies. The technique can also be used to good advantage in design and production engineering, for adjusting circuits for proper operation, and for determining optimum values of components.

OVERALL RESPONSE

The basic relationship between the frequency response of an amplifier or network and its effect on square waves can be obtained by referring to Fig. 9.

A simple resistance-coupled amplifier may have the response shown in Curve 1. With this type of response curve a low-frequency square wave will appear as in Fig. 4E; at middle-range frequencies as at Figs. 4A or 5A; while a high-frequency square wave will appear as at Fig. 5B.

If low-frequency compensation is added, resulting in a boost at low frequencies as shown in Curve 2, middle range and high-frequency square waves will appear as previously, but low-frequency square waves will generally be tilted in the opposite direction, as shown in Fig. 4H. With the proper amount of compensation a perfectly flat-top low-frequency square wave may be obtained, but this is frequently difficult to maintain in production unless each unit is adjusted individually.

HIGH BOOST

When a peaking coil is used to provide a boost at high frequencies the overall response may appear as shown in Curves 3 or 4, depending on the frequency of peaking and the amount of damping. With a response as shown in Curve 3 a high-frequency square wave may appear as in Fig. 5E, while middle and lower-frequency square waves will remain as previously. If the response is as in Curve 4 a high-frequency square wave will appear as in Fig. 5D, and a middle-range frequency square wave as in Fig. 5E.

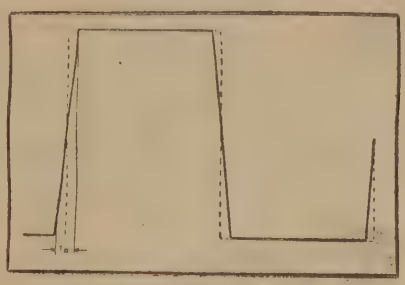


Fig. 6: Illustrating rise time measurement on a square-wave form.

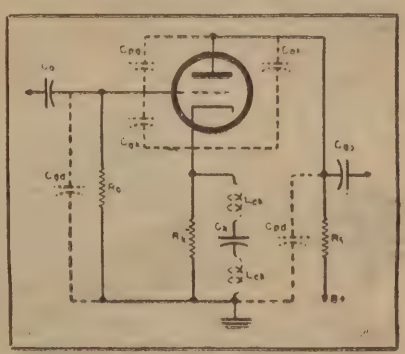


Fig. 7: Distributed capacities and inductances in basic amplifier circuit.

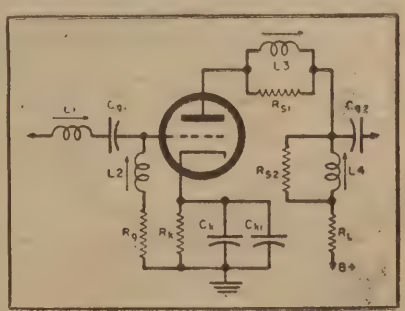


Fig. 8: Series and shunt peaking coils compensate for high-frequency losses.

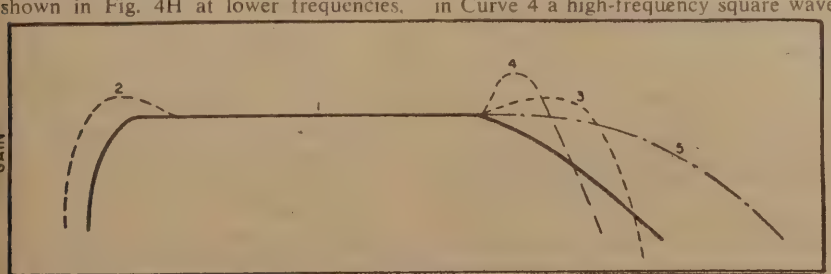


Fig. 9: Basic amplifier response curves showing effects of compensating circuits.

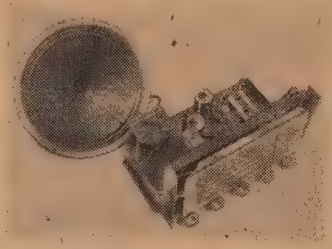
If high-frequency compensation is obtained by reducing distributed capacities a high-frequency square wave can be made to approach the input signal in form, as in Fig. 5A, and the response curve becomes as shown in Curve 5. Note that the response falls off smoothly at higher frequencies.

The same result can be obtained by reducing Rl, but this results in reduced overall gain.

—By Special Arrangement, Radio and Television News.

MASTER ELECTRICS PTY. LTD.

A WHOLLY OWNED SUBSIDIARY COMPANY OF MOTOR SPARES LIMITED



RADIOGRAM CHASSIS

These radiogram chassis were specially designed for high quality reproduction of records and radio programs. A special inverse feed-back circuit is employed and latest types of valves are used, tone and automatic volume controls are incorporated.

The dial is made of perspex and all local stations for each capital city are in large letters and country stations in small. Dial Colours are Gold, Maroon, Black and Yellow Price. 5-valve dual-wave.

£14/19/6

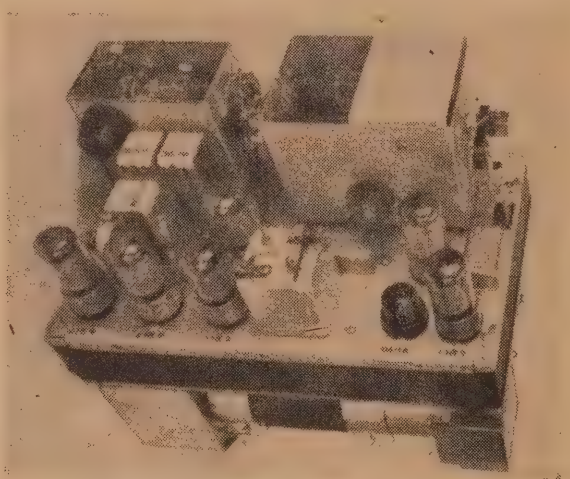
RECORD PLAYER AMPLIFIER

Very compact and light weight. This unit combines a 4½ watt amplifier with two inputs, one for the built-in 3 speed Philips record player and one for a crystal microphone, each input has its own volume control. Also two outputs, one connected to the built-in speaker and one for a separate extension speaker. An on-off switch and tone control is provided. The cabinet is finished in two-toned leatherette ideal for parties or for playing records in the home. Well worth 35 gns.

Price only 27 gns.

6in extension speaker in leatherette covered box. Worth £3/4/- **Our price 49/6**

Crystal microphone to match this unit. **45/-**



IFF SET TYPE B.C. 966

Brand new with 3-7193, 7-6SH7 and 3-6H6 valves, an 18 volt to 450 volt at 50mA genemotor and blower, carbon pile regulator, 3 multi contact relays and dozens of resistors and condensers of all types.

Price only £5/10/-

CHIEFTAIN MULTIMETER

An ideal pocket-sized meter in a plastic case, overal size 5½ x 3¾ x 2⅛in. The meter has 100 ohms per volt sensitivity. Voltage readings are 0-15, 0-150, 0-300, 0-600, and ohms scale reads, 0-100,000 ohms. This multimeter is ideal for the hobbyist, motor mechanic, radio serviceman and electrician.

Price only £4/12/6

★ SPECIALS ★

1. Ferroxcube rod aerials. with coil ideal for portables and mantel radios Equal to 60ft outdoor aerial **Price only 16/6 each.**

2. High Tension Power Supply Transformers. These give 2,000 volts D.C. to work VCR97 or 5BP1 for oscilloscopes or T.V. sets. Circuit for the high frequency power supply with each transformer. **18/6 each.**

3. Germanium Diodes. Ideal for crystal sets, meter rectifiers and radio set detectors. Brand new. English make **Only 5/6 each.**

4. 0-5mA meters with 2in scale and square face **Price only 22/6 each.**

5. 1 amp. Selenium rectifiers for 6 and 12-volt Battery chargers. Brand new English make **Price 22/6 each.**

6. Vibrator Transformers. 6 volt to 135 volt. Ideal for Vibrator receivers using 1.5 or 2-volt valves. Worth 49/6 **Our price 14/6 each.**

7. English make **Magnetic Pickups** with bakelite arm for 78 r.p.m. records only. **10/ each.**

8. 3-inch Extension Speakers, brand new, in bakelite case, all colours, a very good line. Sacrificed for **22/6 ea.**

9. 6½-inch Speakers. Permanent magnet type with 10,000 ohms transformer Brand new and boxed. These will replace speaker in most AC or battery sets. Worth £2/10/ **Our price only 25/ each.**

10. 4-valve Vibrator Mantle Sets, ideal for caravans, etc. These sets operate from a 6-volt battery, they are new and guaranteed in working order. Worth 29 gns **Our price £12/10/- less battery.**

11. 0-150mA Weston Meter, 2-inch scale, round face. Brand new and boxed, few only. **Price only 22/6 ea.**

12. Radio Receivers type BC-357J Made for U.S. Army. This is a 2-valve set operating on high frequency using 1—12C8 and 1—12SQ7 valve and incorporating an extremely sensitive SP relay, resistance of which is 12,500 ohms. These sets are brand new with valves, **only £2/10/ each.**

13. 650 ohm, 20 watt WW Resistors with variable tap **Price only 2/9 ea.**

14. 50,000 ohm WW Resistors on ceramic formers. 5 pc accurate. 5 watts. **2/ each.**

SPECIAL NOTICE

All parcels sent Registered Post unless otherwise stated. Postage or Freight must be included with order.

547 ELIZABETH STREET, MELBOURNE. PHONE: FY0271

BRANCHES THROUGHOUT VICTORIA AND N.S.WALES

A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

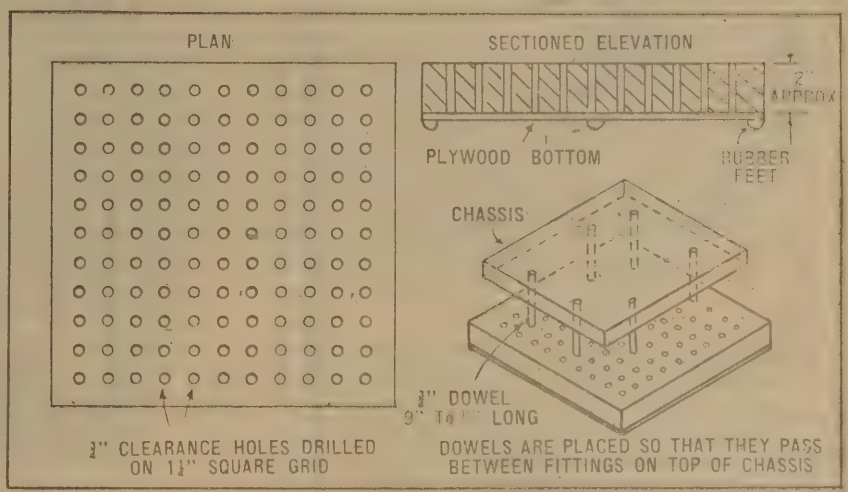
SIMPLE CHASSIS SUPPORT TAKES ANY RADIO RECEIVER

A serious practical difficulty when servicing many receivers is in supporting the chassis in such a way that no damage is done to above chassis parts such as valves, dial mechanism, coils and speaker.

OUR correspondent, Mr. Maxwell C. Geikie, of Coburg, Victoria, offers a suggestion which should cost practically nothing in terms of either time or money to construct. At the same time it should be capable of doing an excellent job of supporting some of the awkward chassis manufacturers sometimes find it necessary to turn out in order to fit in with special cabinet designs.

The chassis is supported by dowels which pass up between components. The dowels may be placed in any one of a number of holes so that chassis components can be cleared.

Mr. Geikie suggests that ¾in dowel be used and made from 9in to 11in long. The number of dowels you need will depend on the work you have in mind but you are unlikely to need more than four for any one job.



The main body of the chassis support can be made from 2in thick material, either plywood or solid being suitable. Holes for the dowels can be drilled in a regular pattern as suggested in the drawing, separated by a distance of 1½ inches.

The dowels are prevented from going right through the baseboard by a piece of 3/16in ply or presswood screwed, nailed or glued to the underneath. Some rubber feet or pieces of felt complete a useful project.

ADDITIONAL CIRCUITS FOR CLOCK RADIO

MR. A. P. CAHILL, of Malvern, explains his idea in detail and we can do no better than to quote directly from his letter. "The idea is to overcome one fault (I think) which exists in clock radios, namely that if the volume is low enough to lull you to sleep then how is it going to wake you up in the morning?

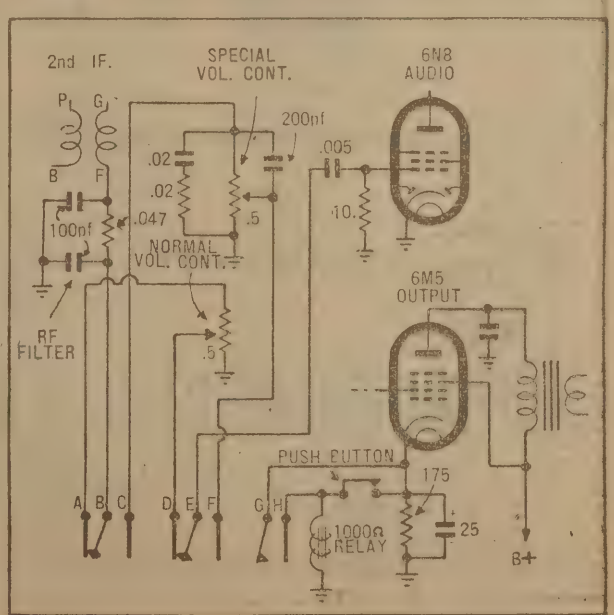
"The circuit (which is adapted to the clock radio in the November, 1955, issue) works as follows: A 1000 ohm, or thereabouts, relay with two sets of single pole, two position, and one other set of contacts. The latter are to be closed when the relay is energised. The relay is wired (see circuit) so that when it is not energised, the normal volume control of the set operates.

"However, when a push-button is depressed, the relay is energised and the preset volume control is wired into circuit. Contacts A-B-C, D-E-F achieve this while contacts G-H lock the relay in position. As the relay draws its power from the output valve cathode bias, the relay cannot be opened until the set is switched off.

"When you want to go to sleep to soft music, you merely press a button, the volume drops to a soft (predetermined) level. The set then switches itself off after the period you have selected on the clock controls.

"When the clock switches the set off, the relay opens, and the volume level returns to that of the normal volume control setting, so that when you awaken in the morning, it is to the sound of loud commercials

"The purpose of the network across the special volume control is to compensate for the bass sensitivity of our ears at low levels. This is achieved by the 0.02 uF capacitor and the 0.02 megohm resistor. The 200 pF capacitor gives a slight treble boost. While this network would cause severe distortion on account of the AC shunting normally, its effect may be discounted as the circuit is only used at low levels. For the same reason the effect of the inductance of the relay may be neglected also."



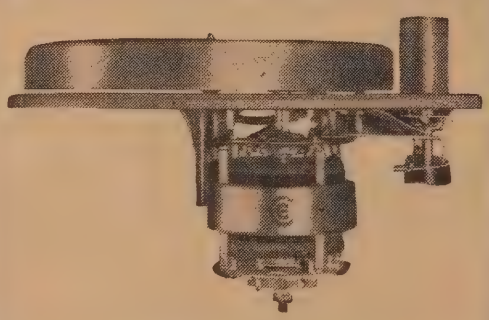
Where quality is essential yet cost a factor, install-

THE NEW 4 SPEED

TRANSCRIPTION TURNTABLE

Following repeated requests for a turntable of professional standards for domestic use by those connoisseurs who require the ultimate in high-fidelity reproduction, we are now producing the Type 12 B, 4 Speed Transcription Turntable

THE TYPE 12B



WHEN YOU INSTALL THE 12B YOU ARE ASSURED OF:—

- ★ PROFESSIONAL PERFORMANCE
- ★ BEAUTIFUL APPEARANCE
- ★ PRECISION ENGINEERING
- ★ SILENT AND RELIABLE OPERATION
- ★ HEAVY-DUTY SYNCHRONOUS MOTOR
- ★ LONG LIFE
- ★ NEGLIGIBLE MAINTENANCE

LIST PRICES:

TYPE 12B	(Synchronous motor)	£39/17/6
TYPE 12B/1	(Shaded pole motor)	£29/15/6

★ *Fully guaranteed, with prompt after-sale service and all replacements readily available from the Manufacturer.*

TRADE INQUIRIES INVITED FROM

Commonwealth Electronics Pty. Ltd.

N.S.W. - - - - - - JAMES STREET, BAULKHAM HILLS
TASMANIA - - - - DERWENT PARK ANNEXE, HOBART

TRADE REVIEWS AND RELEASES

Philips Automatic Record Player

The Philips record player-changer type AG2205/AG-2005 features a new type pickup of high performance, record changing facilities for 45 r.p.m. discs, and three speeds. Of the plug-in pickup heads, the LP version has a diamond point and the 78 version a sapphire as normally supplied.

The appearance and general finish of the new Philips automatic record player is such as to be in keeping with high quality radiogram units.

AN automatic arm positioning movement is provided for 7in, 10in and 12in diameter recordings, but non-standard discs can be played if required. Speeds available are 33 1/3, 45 and 78 r.p.m. There is a fine speed adjustment on all three speeds.

A particularly neat built-in stroboscope enables the speed of the turntable to be checked against the mains where the pitch is required to correspond exactly with that originally recorded. A small window is the only external evidence of this facility.

FULLY AUTOMATIC

With 7in records having a large centre hole (normally 45 r.p.m.) the unit operates as a fully automatic changer. A special large diameter spindle containing the changer mechanism is supplied and the unit will handle eight to 10 records at the one loading, the exact number depending on their thickness.

Interchangeable pickup heads are available to suit either the standard or the microgroove type records with the choice of either diamond or sapphire stylus. The unit can be used with the standard Philips crystal pickup heads and provision has been made for altering stylus pressure for heads of different weight by means of a spring lever built into the base of the arm.

MAGNET DEVICE

Design of the magnetic pickup head normally used with the player is completely new. A drawing and description appeared on page 103 of the July issue. It is a moving magnet device, the magnet being made from lightweight, high coercive material Ferroxdure. Electrical pickup is from the fixed coils of the magnetic system, and output is sufficient for most amplifiers without the use of a transformer.

The effective mass of the stylus tip is 3 mgm; the lateral compliance very high. Frequency response is flat between 30 c/s and 15 Kc/s with the resonance above the upper limit.

Operation of the unit is simple.

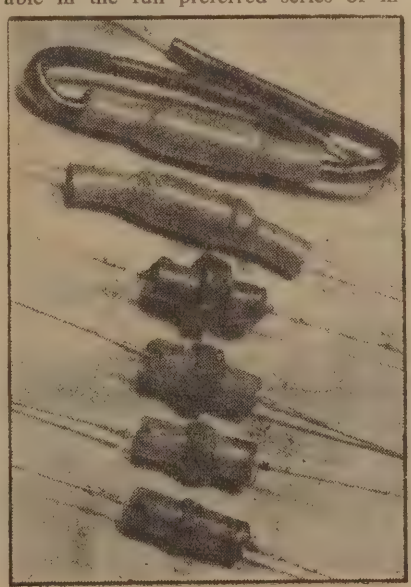
A set of three control buttons is provided. The left button is for automatic operation of the arm when playing single records and according to the amount by which it is pressed the arm will come into position for 7in, 10in or 12in records. The centre knob is marked "Stop" and the right knob "Start." By appropriate manipulation of these as set out in the operating instructions with the unit, all situations can be handled.

On test the pickup, which needs no coupling transformer, gave clean, crisp reproduction with very good bass.

Its compliance makes tracking easy, and in all respects it performs in the highest class. Motor rumble was low, and mechanically the changer operated perfectly.

TELEVISION CHOKES FROM RCS RADIO

FROM RCS Radio Pty. Ltd. come the first of a new range of peaking chokes. Later the chokes will be available in the full preferred series of inductances but the first samples are to suit the "Radio, Television and Hobbies" 17in television receiver having inductances of 15 uH, 47 uH, 150 uH and 330 uH. Inductance values are coloured coded. A fifth choke of small inductance is intended for use in the filament circuit of the receiver. It is wound with heavier wire and provided with a PVC sleeving.



The chokes are wound on a core of ferrous material, the connecting wires being moulded into the body. The terminating wires will support a weight of 28lb and the resistance between them through the core material is over 100 megohms.

Yet another choke submitted is intended for use in vacuum cleaner motors and so on to minimise interference in television receivers due to sparking at the brushes. It is provided with flexible leads and with the PVC covering should be suitable for mounting inside the motor.

We were impressed by the mechanical strength of the chokes which should give little trouble due to breakage of core or leads.

HERE'S THE CAPACITOR...

For ultra miniature installation – famous for long, stable life

Microcap

TYPE W99

★ Here's the capacitor that is being fitted by leading T.V. Receiver manufacturers, who have checked carefully and **proved** for themselves the many advantages offered by Microcap—

Exclusive metallized paper construction, resulting in an ultra miniature space-saving capacitor, which can be fitted in a fraction of the space required for ordinary units of the same rating.

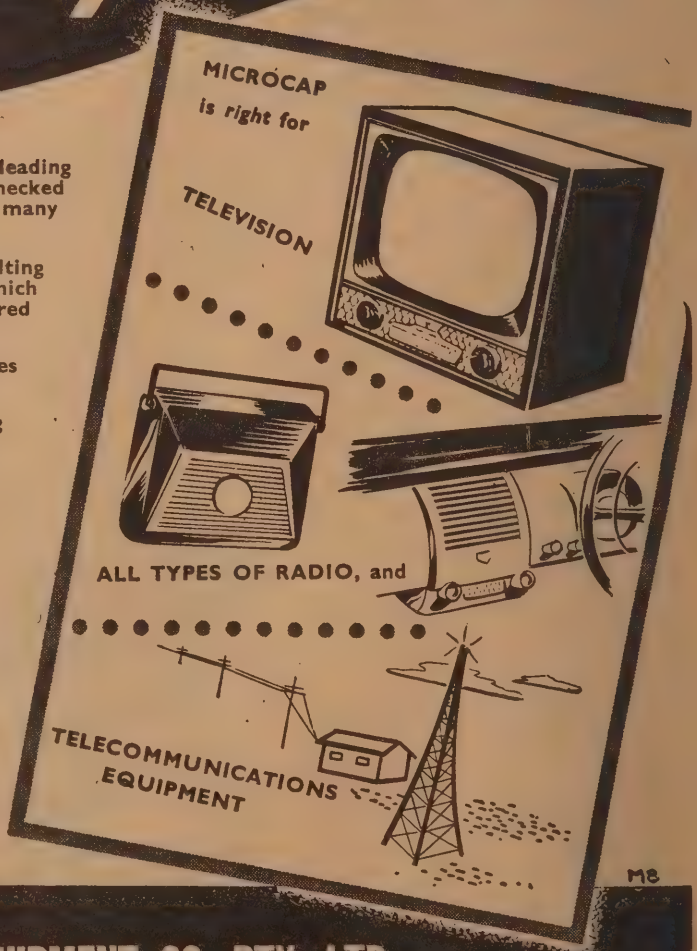
Outstanding "self-healing" feature, which enables Microcap to sustain accidental over-voltage.

Long, stable life in miniature form, reducing servicing problems, greatly overcoming the bugbears of "intermittent" and open or short circuits.

Available in a wide range of capacitance values and voltages.

Despite miniature size, note the generous non-hygroscopic moulding enclosing the capacitor unit: pigtails are soldered directly to unit by special process.

Manufactured in Australia under licence from A. H. Hunt (Capacitors) Ltd., England, by



AUSTRALASIAN ENGINEERING EQUIPMENT CO. PTY. LTD.

476 LATROBE ST., MELBOURNE. FY 2638

NEW RCS COIL FORMERS

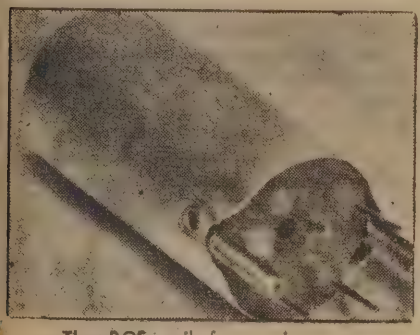
R.C.S. Radio are supplying miniature coil formers with fitting cans suitable for use in television receivers, short-wave receivers and other electronic equipment.

Diameter of the can is 7-8in, length 1¼in, former diameter 8mm. The base is available with either four or five pins.

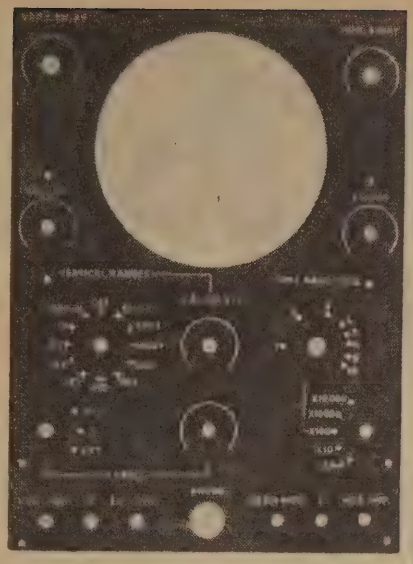
Variable slugs are supplied with the coil. They are ¼in diameter and ½in long, made from ferrite material capable of operating with low loss up to 60 Mc/s, well above the normal television intermediate frequency.

The slugs are fitted with hexagonal hole of the standard dimensions, i.e., 0.11 inches across the flats.

The thread of the ferrite slug corresponds with a thread cut into six ribs which are moulded inside the former. Previously there were four ribs, but R.C.S. have found that the tendency for the slugs to stick is less with the extra ribs.



The RCS coil former in can.



A BLACK enamelled front panel, illustrated above, with all lettering included, for the R., TV and H. wide band oscilloscope is available from R. H. Oxford and Son P/L, of 97 Marriott Street, Sydney. The panel is intended to be placed in front of the mild steel front panel of the instrument proper and held in place by means of the control locking nuts. The base material is aluminium.

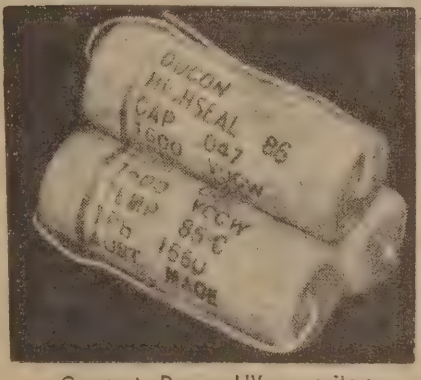
The finish is excellent and the panel will certainly help in giving a professional appearance to the completed instrument. Price is 19/6, plus 25 per cent. sales tax.

DUCON HV CAPACITORS

TUBULAR capacitors which will find application in our 17in television receiver and other projects have been forwarded for comment by Ducon Condenser Ltd. The "Highseal 85" types illustrated have a capacitance of 0.047 uF and are rated to work at 1,600 volts. The overall length is 1¼in and the maximum diameter a little over 5-8in, type No. TPB 1560.

Also useful in television receivers are 1,000-volt working mica capacitors available from the same company.

"Hi-K" ceramic types are also available in high voltage ratings. One example of the last is rated at 1,000 pF and 2,000 volts working. It measures only ½in diam. and 1-8in thick and is therefore an excellent example of modern compact capacitor design.



Compact Ducon HV capacitors.

NEW R.C.S. UNITS FOR R. & H. 17-INCH TV

COMB. VIDEO — IF AND SOUND STRIP

Part No. 554
Price £5/15/- Plus Tax.

DETAILS Combination Video—IF. Sound Strip consists of 5 video IF's., 2 sound 5.5m/cs. IF's and 1 ratio detector mounted on combination cadmium chassis, all holes punched. Circuit and details supplied. IF set at correct frequencies.

INCREMENTAL TUNER

Part No. 553 Price £3/13/4 Plus Tax.

1 Cadmium Bracket, all holes punched.
1 Video Coupling Transformer.
1 - 2 Bank by 3 Position Switch with 6 Coils mounted.
1 Concentric Fine Tuner Control.
1 Circuit.

Filter Chokes & Transformers

Part No. 77 3H 30ma	Price 20/-
Part No. 76 15H 60ma	Price 14/-
Part No. 78 1H 300ma	Price 20/-
Part No. 80 2.5v 1.75 amp 5Kv. insula.	Price 26/8
Part No. 61 4.0v 1.0 amp 5Kv insula.	Price 26/8
Part No. 62 6.3v .6 amp 5Kv. insula.	Price 26/8
Part No. 63 Frame Output Trans. 6BM 8.	33/4

(Trade prices subject to sales tax)

IF'S, Etc.

Part No.	Price
200 Sound IF	11/4
201 Ratio Detector	19/4
202, 203, 204 Video IF's	11/4
504 4 Pin Coil Assembly	4/8
505 5 Pin Coil Assembly	4/8
534 Coil Dope and Core Sealing Lacquer	3/- per bot.
209 Cathode Sound Trap	11/4

VIDEO and RF CHOKES

Part No.	Price
408 Aer. RF Choke, C.T. 2uH	3/4
409 2uH filament Choke	3/4
410 15uH Video Choke	3/4
411 47uH Video Choke	3/4
412 150uH Video Choke	3/4
413 330uH Video Choke	3/4
414 TV Noise Filter	3/4
415 3u8 Damper Diode Choke	3/4

NOISE SUPPRESSION

Part No. 11 Aerial Filter Kit	Price 140/-
19 ½amp Line Filter	50/-
20 ¾amp Line Filter	47/-
26 ¾amp Line Filter with condensers	53/-
22 5amp Line Filter with condensers	90/-
24 2amp Line Filter	56/-
27 2amp Line Filter with condensers	65/-

Above prices are Retail Prices and inclusive of Sales Tax.
FOR UNIT WIRING AND TESTING SERVICE Phone JY1744

R.C.S.
RADIO PTY. LTD.

651 FOREST RD., BEXLEY, N.S.W. LW3491-5385

A COURSE IN TELEVISION

PART 23 — VIDEO AMPLIFIER STAGES (Continued)

Continuing last month's study of video amplifier circuits, we further discuss methods of video gain control, as utilised in most receivers to vary picture contrast. The rest of the article deals with the vital subject of frequency response.

IN a television receiver, the considerations which govern the placement in a circuit of the gain control are parallel to those which apply in an AM sound receiver. Over and above the obvious requirement to vary picture contrast—or sound volume—due consideration must be given to preventing overload, with strong input signals, of any stage or number of stages.

In early model television receivers, the video section operated at full gain and picture contrast was controlled by varying the gain of the high frequency amplifier circuits. Properly applied, this method also ensured that no stage in the receiver would be overloaded.

USE OF AGC

Later, when a multiplicity of channels and other considerations made automatic gain control desirable, control of "front-end" gain was taken over by the A.G.C. system.

This levelled out obvious variations in signal strength and prevented overload but a subsidiary contrast control still had to be provided to compensate for inadequacies of the automatic control, variation in program material or variation in viewing conditions.

This subsidiary control is normally located in the video amplifier circuit though, in part 21 of this course, we gave the circuit for a contrast control which operated in conjunction with a keyed A.G.C. system, to vary the output from the video detector.

Provided the use of keyed A.G.C. is not an objection, this general approach has much to recommend it. It gives a wide range of manual control and avoids some of the complications which arise from trying to effect gain control in the actual video amplifier circuits.

The nature of these difficulties will be better understood by reference to figure 133.

Diagram (a) shows the normal potentiometer method, as used in audio circuits. The signal voltage developed across the total resistance of a potentiometer and any desired proportion of the whole may be selected by means of the moving contact.

The method is a very convenient one, because it gives complete control over the signal amplitude, from maximum to zero and need not disturb the operating potentials of the associated valves.

The diagram illustrates two possible positions for such a control—the usual one in the grid circuit of an amplifier and a second in the plate circuit. The latter position involves passing direct current through the resistance element which may or may not be considered desirable.

For all its merit in other respects, there is a serious objection to the potentiometer method, involving circuit capacitances.

In a practical potentiometer, there is inevitably some capacitance between the active terminal and the moving contact and there is a tendency for high frequency signal components to couple directly between these points, irrespective of the division indicated by the resistance element.

LOSSES FROM SHIELDING

Shielding to minimise this shunt leakage would inevitably add capacitance to ground and introduce its own problems.

Capacitance to ground, affecting high frequency response, is always a problem in a video amplifier, as we shall see a little later. Normal practice is to keep it as low as possible and also to keep down the impedance of all active signal circuits. Such loss as may then still be apparent is compensated by providing a discreet amount of high frequency boost elsewhere in the circuit.

The right order of high frequency boost can only be provided if the loss is known and constant. Herein lies another serious difficulty with figure 133 (a). A significant proportion of the capacitance to ground has to do with the circuits connecting to the moving tap of the potentiometer.

But the impedance to ground from this point varies with the setting of the potentiometer, being often highest when the tapping is near the centre of the element. Allowing for this effect and possible capacitive leakage, as mentioned earlier, the high frequency response may be so unpredictable and subject to alteration that accurate compensation becomes virtually impossible.

The complications to which this can lead will be explained later

CATHODE FOLLOWER

A special case exists for the potentiometer method, where it can be placed in the output circuit of a cathode-follower stage. The net circuit impedance may then be kept low enough to minimise the above complications, though it automatically assumes a two-stage video system.

Because of these problems, other methods have been sought of controlling video stage gain, preferably without disturbing active signal circuits. One such method is shown in figure 133(b), involving a variation in the screen potential of a pentode.

Though this method has been used, it is not above criticism. While variation of the screen potential does affect stage gain to some degree, it inevitably has a much greater affect on the operating conditions of the valve. Unless circumstances are fortuitous, the combination of high input signal and low screen voltage to counteract that signal, will lead to an overload condition and degeneration of the picture quality.

Another possible complication can arise from the variation in plate potential occasioned by a change on screen voltage. If the plate is directly coupled to another stage or to the picture tube, manipulation of the contrast control can react on the said stage or on picture brightness, with an undesirable or confusing result.

Figure 133(c) shows a still further method of controlling stage gain, which finds fairly wide current use. It involves placing a variable, unbypassed resistor in the cathode circuit of the video amplifier.

The intention is not to vary the bias, but to secure a greater or lesser degenerative loss in the cathode circuit, thereby alter-

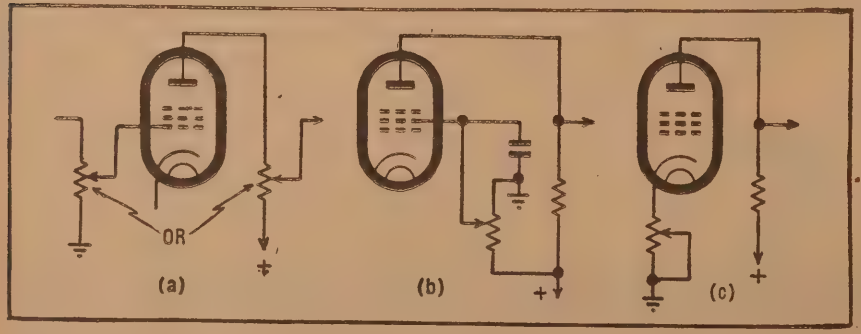


Figure 133: Three methods of video contrast control are illustrated here. Method (a) has capacitive limitations, (b) adversely affects valve operating conditions. Method (c) is probably the most practical and widely used.

ing stage gain. (The method is used in the R.T. and H. 17in receiver.)

Whether or not the bias is affected depends on the grid return path. If the grid is capacitively coupled to the preceding stage and returned through a resistor to its own cathode, then bias will not be affected. The reverse is true if the grid is returned to ground.

In the R.T. and H. receiver, the video amplifier grid is directly coupled to the video detector and therefore follows the excursions across the detector load from near zero at peak white to a substantial negative voltage on synch pulses.

LITTLE EXTRA BIAS

The bias is therefore set predominantly by the detector but is added to by any voltage which may be developed instantaneously across the cathode resistor. Little standing bias is produced because there is no storage capacitor in circuit and, with large signal input, he cathode current swings freely between its dynamic limits.

On low signal input, when the detector bias diminishes and video cathode current rises, operation of the control to secure more contrast, reduces the amount of resistance in circuit.

Despite this, however, operation of a variable cathode resistor must have some reaction on standing potentials and may complicate matters in a directly coupled video system. There are no such problems, of course, where capacitance coupling is used.

The main limitation of the method is that it does not afford complete control between full gain and zero output. However, this order of variation is not needed for practical picture control and it is only a matter of arranging the signal level and gain from the video detector onward to effect all the video control that is necessary.

So much then for the matter of video gain control. It now remains to discuss the question of video amplifier response which is closley related to matters of gain and voltage output.

The video frequencies involved in modern high definition television have already been discussed but can be mentioned again for clarity.

At the low frequency end, the limit figure is rather difficult to set, because it is confused by the possible use of direct coupling, or by AC coupling with or without DC restoration.

DIRECT COUPLING

Where direct coupling is used, it can be assumed that any change in signal level, no matter how gradual, will be passed on to the next stage. In other words, the response can be said to extend to zero cycles per second.

However, it should be noted that this observation applies only to the directly coupled stage. If a coupling capacitor appears anywhere else in the detector to picture-tube signal circuit, it will automatically become a limiting factor as far as low frequency response is concerned.

Again, if a directly coupled amplifier should involve a pentode with a screen bypass capacitor, some degeneration is inevitable, despite the DC coupling, at a frequency where the screen bypass ceases to be effective.

Where AC coupling is used, the effect of all coupling as well as bypass capacitors is cumulative and, as in a conventional R/C audio amplifier, there will be some low frequency region in which the response will roll off quite sharply.

As a general rule, it is often suggested that the video amplifier should be able to sustain a potential at the picture tube grid or cathode for a period equal at least to the duration of one complete frame, or two interlaced fields.

The basis of the proposition is that an originally plain background should not reproduce as a noticeably shaded background from top to bottom of the screen, due to the loss of charge in the video coupling circuits, within the duration of one frame.

This implies, in turn, the ability to reproduce a rectangular waveform, having a repetition frequency of 25 cps. In terms of sine wave performance, this would amount to a nominal response extending to a few cycles per second.

Visually, this produces a lack of clarity and "weight" in adjacent areas of black and white, particularly in patterns and titles.

While some distinction can be drawn between phase and frequency characteristics, it is not far from the truth to say that the phase characteristics of a video amplifier will be adequate if the system has the suggested order of low frequency response, overall.

Phase and frequency characteristics at the high frequency end have yet to be discussed.

Figure 134 shows a generalised circuit digram for a resistance-coupled amplifier stage, with components designated, which are significant to bass response.

Firstly, there are the components in the cathode circuit, the bias resistor and its attendant bypass capacitor.

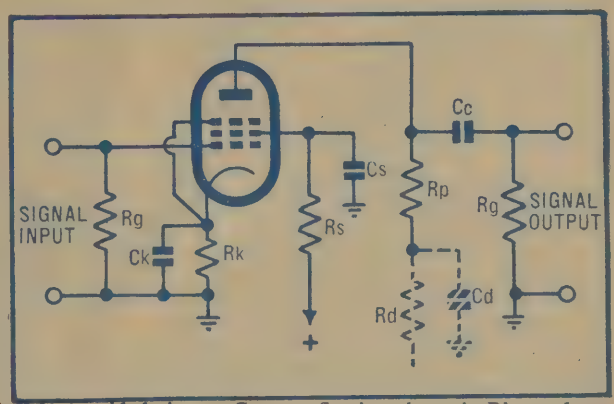


Figure 134: Here is the circuit of a conventional resistance-coupled amplifier stage. The article explains the components which govern low frequency response and a method of low frequency compensation.

Where DC restoration is provided, it serves to sustain signal levels for virtually indefinite periods and may, in this sense, be said to extend bass response to zero frequency. However, there is more to it than that.

Quite apart from the matter of frequency response, as such, the attendant problem of low frequency phase distortion must be considered in a television system.

Abrupt black-and-white divisions in the picture represent stepped functions, requiring a very wide range of frequency components for their reproduction, all in critical amplitude and phase relationship.

BACK ISSUES

IT is regretted that back numbers containing early instalments of "A Course In Television" are no longer available. However, we can supply isues from May, 1956, onwards at a cost of two shillings per issue.

If circuit conditions should cause a phase delay of only a few degrees at very low frequencies, it can still represent sufficient time delay for the low frequency changes still to be happening after the scanning spot has moved an appreciable distance from where each division should be.

In the case of horizontal divisions in the picture, the delay may be sufficient to affect two or three complete scanning lines.

Current flowing through Rk produces a voltage drop across it, which makes the cathode positive with respect to ground and to grid. This is equivalent to applying an equivalent negative bias to the grid itself.

Because the cathode current varies instantaneously with signal, the voltage across it normally tends to vary in proportion and this produces a degenerative effect.

CATHODE FOLLOWS

For example, if a positive-going signal is applied to the grid at a particular instant, the resulting increase in cathode current will cause the cathode to become more positive also.

The DIFFERENCE between grid and cathode voltages, which represents the effective input signal, is therefore less than it would be if the cathode potential had remained fixed. The tendency for the cathode to "follow" the grid potential thus produces loss of stage gain, being a degenrative effect.

In audio amplifier practice, this difficulty is offset by connecting a large value capacitor in parallel with the cathode resistor, a figure of 25 mfd. being quite common. The capacitor charges to the average potential developed across Rk and, due to storage effect, will not allow the cathode voltage to rise or fall significantly in step with the input signal.

In audio work, the lowest significant signal is usually reckoned to be about a 30-cycle sine wave and it is usually not very difficult to arrange that the capacitor have sufficient storage to be effective at this frequency.

ONLY PLANNED HIGH FIDELITY GIVES YOU TRUE HIGH FIDELITY

— *IN RADIO - PHONOGRAPH REPRODUCTION*

Putting together a hi-fi system for your home can be simple — and it probably will cost a lot less than you think! Here at Modular we offer the kind of information and guidance that will help you get started right and avoid mistakes.

As you may know, possible combinations of components are practically limitless. We're happy to help you choose what will best suit your home and your budget. You can start small and add as you wish.

RING US NOW AT XM4879

or call at Modular Electronics or write for further information. Let us help you plan the kind of high fidelity system that will give you true high fidelity.

MODULAR

ELECTRONICS

18 Peronne Ave., Clontarf. XM4879

However, for television work, very low frequency components are much more evident and important to the end result and the problem has to be approached with greater care.

If the "storage effect" of the capacitor is to be adequate, it can be stated in rather more technical terms, that the reactance of the capacitor in ohms must be less than the value of the bias resistor down to the lowest significant signal frequency.

Since this latter may be counted as only a few cycles per second and since the bias resistor for a high-gain video valve may itself be quite low in value, the difficulty of meeting the above requirement is obvious.

POSSIBLE COURSES

Where gain is at a premium, a designer may be obliged to specify an adequate capacitor, even though it may be unduly large and expensive. Alternatively, he may devise a way of biasing the grid directly, allowing the cathode to be earthed.

More common practice in television receivers is simply to omit the bypass capacitor altogether. This causes a loss of gain, usually about 2:1, but since it is apparent at all frequencies, there is no discriminatory effect.

In the case of a pentode amplifier, consideration must also be given to the screen circuit. For correct operation, the screen potential should remain constant, irrespective of instantaneous variations in screen current with signal.

In a sense, the problem is akin to that of the cathode voltage but with the important difference that the natural impedance of the screen circuit is higher. The screen current is lower than the cathode current and the supply resistor much larger. It is therefore possible, by using a standard 8 or 16 mfd. electrolytic, to hold the screen potential constant against even quite low frequency variations in screen current with signal.

It should be noted in passing that the screen potential can also be stabilised by feeding it from a divider network connected between the HT line and earth (or cathode). Provided the bleed current can be made substantially higher than the screen current, degenerative loss will be slight and will be constant for all frequencies.

HT SUPPLY IMPEDANCE

In the plate circuit, some significance attaches to the impedance of the high-tension line and power supply. This is so because, under certain conditions, the video output stage may draw high current for a significant interval of time, equivalent to a very low frequency signal.

The increased current can conceivably react through the common power supply to another stage, to modify its gain.

As a rule, the power supply of a television receiver is of generous proportions with large filter capacitors (upwards of 100mfd) and power supply impedence is not a serious problem.

Probably the most significant single component in terms of low frequency response, is the interstage coupling capacitor Cc.

Basically, its function is to isolate the DC plate potential from the signal output circuit but to pass to this circuit the entire AC signal component.

In fact, the signal current can be visualised as flowing through a series circuit comprising the coupling capacitor, the following resistor Rg and the valve combined with its plate load. The circuit is illustrated in figure 135.

If the coupling capacitor has negligible reactance, the current through the circuit is dependent primarily on the value of Rg and the parallel resultant of the valve's plate load and its own plate resistance. The voltage drop across Rg, which constitutes the signal output, is then the product of signal current times Rg.

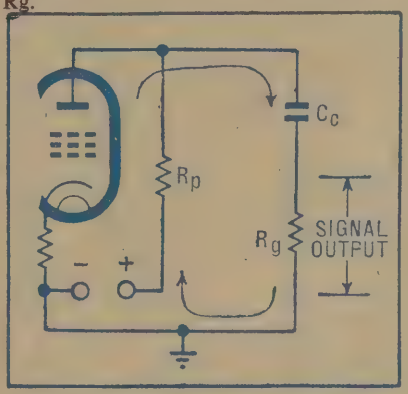


Figure 135: The coupling capacitor in an R/C coupled stage is really part of a series circuit involving an AC generator (the valve and its plate load) a coupling medium (cc) and a load (Rg). When the reactance of the coupling medium rises, the current through the load and the voltage across it must fall.

The reactance of the coupling capacitor, Cc, will inevitably increase at low frequencies and, if it should rise sufficiently to modify the current through the series network, then the signal voltage developed across Rg must diminish. At the same time, it will be shifted in phase.

It follows from the foregoing that the amount of capacitive reactance which can be tolerated is directly related to the amount of resistance in circuit. If the net resultant of Rg, Rp and plate resistance is high, then the reactance of Cc can likewise be fairly high (or capacitance fairly low).

The same order of capacitive reactance in a circuit of low net resistance would be unacceptable.

LOW PLATE LOAD

In a practical video amplifier stage, the plate load resistor, Rp, is normally quite low, being usually around 3,000 to 5,000 ohms.

On the other hand, Rg can usually be fairly high and certainly not less than 0.1meg. Therefore the value of Cc is largely set by the value of Rg. As the value of Rg is increased, so can the capacitance of Cc be reduced for any given order of bass response.

In general, the value of Rg is determined by ratings or requirements to do with the following stage, whether it be another amplifier or the picture tube itself.

Obviously enough, it should be kept as high as conveniently possible, in order that the value of Cc can be kept down. A coupling capacitor which is unnecessarily large is costly, difficult to mount and increases the chance of high frequency loss due to stray capacitance.

TYPICAL VALUES

Typical coupling constants, as used in the R.T. and H. television receiver are an 0.5 mfd coupling capacitor feeding into a 0.1meg following resistor. Calculation will show that the reactance of a 0.5mfd capacitor reaches 0.1meg only at 3 cycles per second.

This might suggest that ... response is 2:1 down at 3cps but even this is not the case. Because of phase shift in the network, the actual loss when the reactance of Cc equals the resistance of Rg, is equal to about 3db.

In many television receivers, using only a single stage of video amplification, there may only be one coupling capacitor in circuit, namely between the plate of the video amplifier and the cathode of the picture tube. In this case, Rg would be the cathode return resistor.

The video amplifier grid is commonly connected directly to the video detector load, being biased by the voltage developed therefrom.

Where more than one coupling capacitor is used, or where low frequency loss is likely to be incurred elsewhere in the syst ..., all such losses are cumulative in their effect.

In most cases, it is possible to preserve adequate low frequency response by attention to the foregoing details, choosing components of adequate value. However, should circumstances dictate an unacceptable amount of low frequency attenuation, some correction is possible in the plate circuit of the video amplifier. The relevant components are shown dotted in figure 134, being marked Rd and Cd.

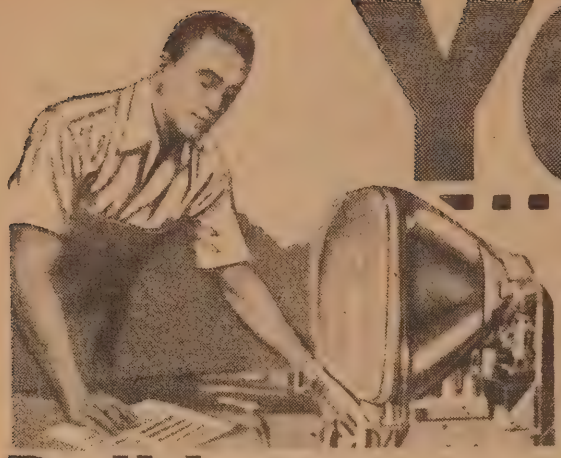
LOW FREQUENCY BOOST

By way of example, if the video response should be down by 2:1 at some low reference frequency, the gain can be restored at this frequency by doubling approximately the effective value of the plate load. This can be achieved by connecting a resistor Rd in series with Rp as shown.

However, the additional gain must not apply for middle and high frequencies and, accordingly, the junction of the two resistors is by-passed with a capacitor of carefully selected value.

At middle and high frequencies only Rp must be in circuit, so that the reactance of Cd must be low. Approaching the low frequency end, the reactance of Cd must rise sufficiently to allow a small extra signal voltage to be developed across Rd. At the very low reference frequency, Cd must be ineffective, allowing full signal voltage to be developed across Rd and added to that across Rp.

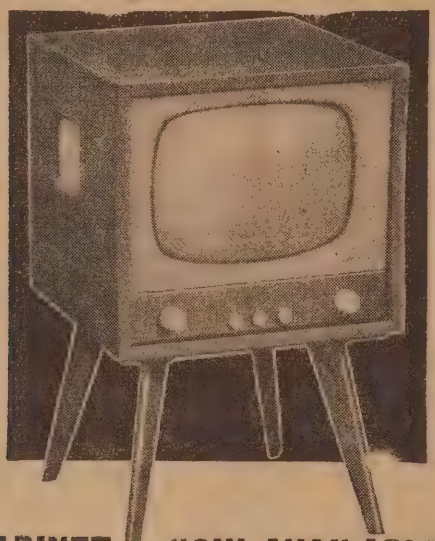
The values for Rd and Cd can be estimated or determined practically to give close correction for low frequency losses elsewhere in the video circuit phase relationships being improved at the same time.



YOU CAN

Yes, you save money, make money when you build an E.P. kit set!

Build your own 17in T.V. set!



CABINET NOW AVAILABLE

Yes! We can supply a craftsman-built version of the "R. T.V. & H." cabinet in walnut, or maple.

SPECIAL PARTS NOW IN STOCK

Ready drilled T.V receiver chassis with 3 brackets and E.H.T. box suitable for "R.T.V. and H." tuner or commercial tuners, cadmium plated £3/12/6

Ready drilled brass tuner box 19/-

Set of 10 A.W.A. Deflection components £12/11/8

Ready drilled, cadmium plated chassis for I.F. strip 19/6

Power Transformer to "R T V and H." specifications £6/18/-

Filter choke £1/15/-

The A.W.A. 17HP4B is the correct picture tube £30/14/-

Picture masks and picture tube sockets available ex stock.

(POSTAGE EXTRA ON ABOVE PRICES.)

IMPORTANT Before buying any individual components for your T.V set, investigate Electronic Parts price for the kit, complete or in sections —it's amazingly low.

TRADE ALSO SUPPLIED

Send for details NOW

TO ELECTRONIC PARTS PTY. LTD.

Dear Sirs,

Please forward descriptive price list of the T.V. Kit Set.

NAME.....

ADDRESS.....

.....

The "R. T.V. & H." Television Set is a winner. We have built it and can testify that picture clarity is better than most, and equal to the best commercial sets. This outstanding design offers the hobbyist a remarkable opportunity to make a first-class TV set at extremely low cost.

Complete Kit available

The E.P. kit is complete with all necessary high grade materials right down to the last nut and bolt. Write, phone or call for descriptive price list. Everything as specified by "R. T.V. & H."

- To spread the cost, the kit may be purchased in the four constructional stages described in "R. T.V. & H."
- Laboratory checking and alignment service available.
- Working model on view at our premises.

Yes, not only can you check your assembly and wiring against our master model, but if you wish we will check and align your completed T.V. set.

It's easy with an E.P. Kit

- Ready drilled chassis, including brackets, E.H.T. box, etc., all cadmium plated, and passivated.
- All special mechanical parts included — i.e. knob bushes, pot'-shafts, pot'-bushes, etc.
- Designed to use "R. T.V. & H." tuner kit or ready built commercial tuners.
- There is a choice of several I.F. strips and other major components.

ELECTRONIC

THE T.V. KIT SET SPECIALISTS

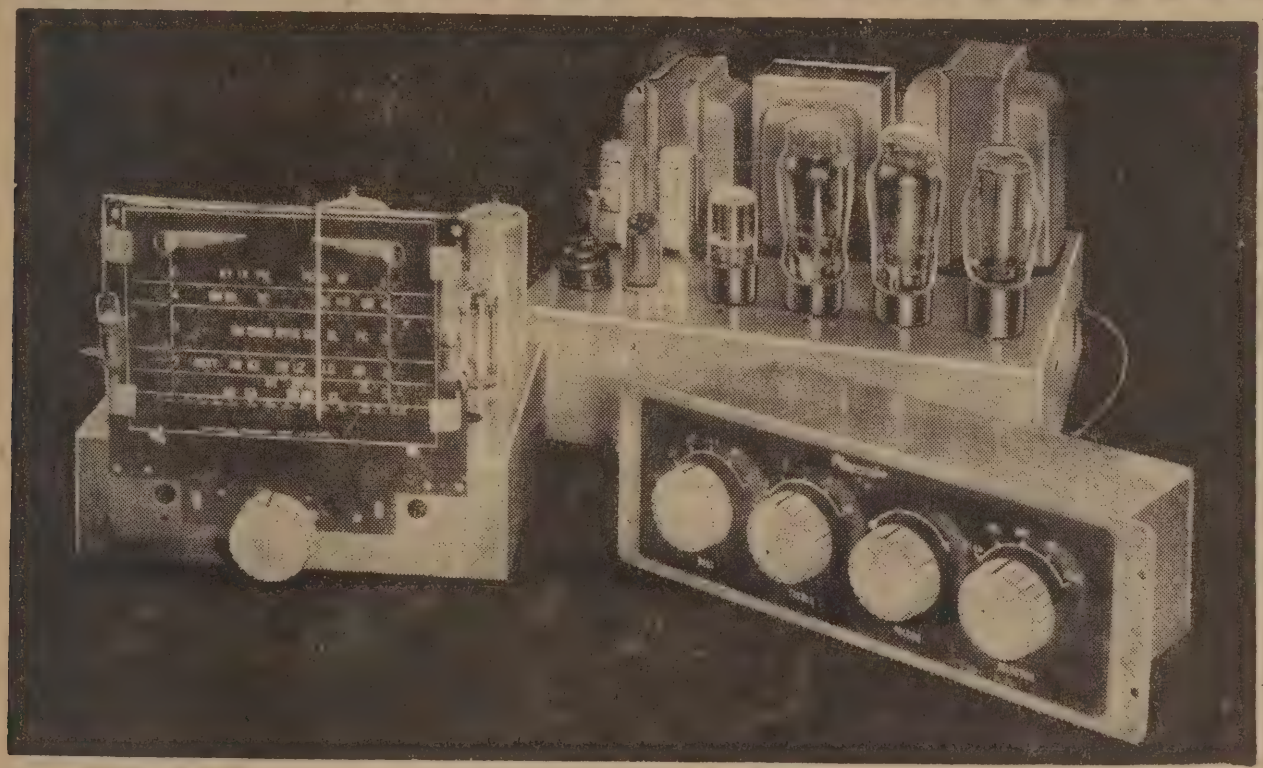
E. S. & A. BANK BUILDING

(opp. Grace Bros.)

Corner Broadway & City Rd., Sydney.

Phone: BA4891-2-3

BUILD IT YOURSELF!



Build your own Hi-Fi outfit!

PLAYMASTER HIGH FIDELITY AMPLIFIERS TUNERS CONTROL UNITS

Designed by "Radio, Television and Hobbies" this high-grade equipment offers combinations of units to suit every requirement. Quality of reproduction on performance and figures is amazing. Furthermore, the cost is much lower than that of similar powered imported units. If you prefer to build your own hi-fi gear, we can supply the kit of parts containing precisely the same high-grade components as are used in the completely built unit

The range includes high quality amplifiers from 20 watts to 5 watts, control units, and a complete range of tuners (including the latest F.M. tuner). You are invited to write, phone or call for illustrated descriptive catalogue.

PARTS Pty. Ltd.

THE HI-FI SPECIALISTS

E. S. & A. BANK BUILDING
(opp. Grace Bros.)
Corner of Broadway & City Rd.,
Sydney, N.S.W. PHONE BA4893

SPECIAL! **A COMPLETE HIGH-GRADE PLAYMASTER OUTFIT FOR UNDER £50**

If you are keen to obtain hi-fidelity reproduction, something much better than could be expected from even the more expensive radiograms, this genuine hi-fi outfit will appeal to you. It comprises Playmaster 5/6 watt amplifier (available as a kit or completely built), the sensational Magnavox 12 WR twin cone speaker and latest Dual record player. Operated from a suitably designed cabinet it gives truly superior quality reproduction of your recordings. Send now for Playmaster catalogue

Send for details NOW
TO ELECTRONIC PARTS PTY. LTD.

Dear Sirs,
Please mail me your free catalogue describing Playmaster Hi-Fi equipment.

NAME .....

ADDRESS .....

OFF THE RECORD — NEWS & REVIEWS

Looking back over the long hours spent in listening to records of all kinds, I find I have been wrestling with one problem in particular, that of deciding when a certain type of sound is appropriate to the music being played and when it is not. The problem is most acute with the more complex combinations, but it exists even with solo instruments.

by John Moyle

IT is, perhaps, most profitable to consider the point as applied to the symphony orchestra, which has the greatest potential of sound and colour, and is easily the most popular in the classical field where such matters are important. Time was when recording engineers could do little more than spray one or two microphones about the place and hope they got something that sounded vaguely like a symphony.

Today they can treat each group of instruments individually, pick out the soloist if any, and even add reverberation, either selectively or over the whole. Their microphones are so sensitive, and their mixing techniques so smooth that they can record in magnified form sounds which otherwise would be completely lost.

SPECIALISED SOUND

For several years now, ever since this kind of thing has been going on, specialised treatment of sounds has opened up an exciting new field by which, through the medium of wide-range, low distortion equipment, we have been presented with a new and fascinating world.

And because records have to be sold, and because there is great competition in the field, more and more gimmicks have been thought up, and the search for vivid noise has gone on.

Now a good deal of music responds well to this treatment, and nearly all of it can be improved.

But where do we stop?

I have always put forward the position that records do not aim to recreate a concert hall performance, nor could they successfully do so for many reasons. They have given us a new method of hearing music which can stand in its own right and cannot be rivalled by any other method. I have even gone on record as saying that the performance on disc need not necessarily bear any relationship to what we hear at a concert.

ONLY A PART

But this is only part of the story. It is I believe true to say that most of the world's best music was not intended to be heard through multiple ears, whose greatest sin is that they should miss a single note from a single instrument.

The composers in most cases wrote the music to be heard as a whole. Most of their sound colours depend on a blending of sound, not a separation of it. When such separation is called for, the score allows for it. Brahms, Beethoven, Mahler and Bruckner, naming but a few good examples, are simply torn to shreds when denied the necessary "air," to use a favourite word of mine for their big sounds to develop.

Less powerful music withstands close treatment much more successfully; chamber music is generally improved thereby.

But even then, there is little to be served by catching every indrawn breath, every sound of the pianist's pedal, and so on, for such forward presence cannot be relieved by playing at low volume or other simple domestic tricks.

If we do not strive to emulate a concert hall, at least we must temper our recording acoustics so that the original sonic idea of the composer is treated with appropriate respect.

MULTI-CHANNEL

It may be that we have reached the stage where the recording engineers have outgrown the limits of their medium, and that multi-channel sound is the only way in which this problem can be solved.

For when we add a third dimension to music, the entire approach to sound colouration must change, and most of the techniques now applied to monaural listening will be abandoned.

But in the meantime there is no reason why we should not strive to temper our new found powers to the music in hand, so that, if we do not always present an ear-tickling sensation in sound, we do bring at least the kind of musical impact which the composer had in mind.

I would like to quote from Goddard Lieberson, President of the American Columbia record company, in an article which appeared in a recent issue of High Fidelity magazine. I could not express what he says more pertinently and I think it is good to read such things from a man who makes records.

It is only fair to say that many recording executives would agree with him.

"For most people, a 'recording' has the quality inherent in the basic meaning of that word: something set down for remembrance, a record of previous aural experience that was pleasurable. And when a recording introduces us to a new listening experience, it soon becomes again a "record" of the first listening. The job of the record maker is very often that of recalling with excitement a previous experience of the auditor. He must do this with skill and integrity. I use the last word because there is often the temptation to create excitement, or spectacular sound, at the expense of historical accuracy.

In considering new paths in electronics in terms of music, there are moments, too, when it is necessary to pause for artistic identification and ask ourselves if the microscope is not being applied too diligently on the behalf of hyperrealism.

Are we, in fact, distorting the composer's concept and consequently doing a serious dis-service to music?

I remember once speaking to Aaron Copland concerning certain recordings of his music, and he confessed that he now heard inner voices in his composition which had not only never been clearly delineated in concert hall performances, but had not even been heard. I think he was more surprised than either disturbed or pleased by this, and I am not sure yet whether or not he has given it very much consideration, though I should think he had.

But in any case, Aaron Copland is very much alive, capable of speaking for himself, and able to protect his music from whatever developments of the moment he might consider as infringing on his prerogatives as a composer.

OLDER COMPOSERS

But what about the dead composers and their music? Are we doing a service to music when we reveal all of the threads in its tapestry? I suspect not.

I know that a composer very often writes incidental orchestral figures or complicated ostinatos as a background of sound — and these sounds are obviously not meant to be heard either as a pattern or as thematic material. No one can possibly believe that many of the inner figures in, let us say, a score by Richard Strauss or Maurice Ravel are meant to be heard in any way other than as a general sound, one might say almost as a sound effect.

Yet, today, there are certain quarters where a piercing cry of joy is emitted when the ring of a triangle or the clang of a cymbal is heard all out of proportion to the composer's intent, or when a small rhythmic figure in a harp is given the stature of a theme though its original purpose was merely atmospheric. And, in my opinion, this bedevilment not only happens to the music of the romantic or modern composers.

FREQUENT DISSERVICE

Classical music, too, very often suffers this same disservice. Although it is quite likely true that even in concert performances we are not hearing Mozart or Beethoven symphonies, Bach, Handel, or Vivaldi orchestral works in the same proportions, or, if you will, the same sound weights, in which they were conceived, yet those disproportions are probably less grotesque than they are under electronic magnification.

Therefore, there is still serious work

to be done in achieving standards in the field of recording which will give the recording industry an objective

Will that objective be the reproduction of a concert-hall sound, and if so what kind of concert hall ?

For my part, I would choose as the standard the objectives chosen by the composer himself in his own era with all of the limitations of that era. I am not by any means against experimentation, but let us have that in the work of living composers, or living inventors of sound, who can create specifically for the phonograph as a musical instrument with a life of its own which indeed it has.

When in the light of the subject under discussion we speak of man's consciousness and of his thinking ability, we are led also to the consideration of his spiritual life, or at the very least, his inner life as it is related to sound That I have thus far concerned myself chiefly with pragmatic aspects of recordings does not mean that I look upon electronic developments only from the vantage point of empirical psychology On the contrary, I believe that the science of electronic recording, deeply intertwined as it is with human emotions music, or speech, has its own mystique

MORE TO BE LEARNED

Recently, at a recording session, when after interminable adjustments and innumerable discussions, the balance of sound came perfectly into focus. I asked my engineer colleague for an explanation of what changes had accomplished this miracle. He could only shrug and admit that he didn't know couldn't be sure When I said, "Do you mean that there are still mysteries in this business?" he answered fervently "Yes, thank God."

(End of quote)

It's true, isn't it? There are records I hear which move me for reasons which I can no more explain coherently than I can fly unaided. It is in fact one of the chief mental tortures of a critic that h must eternally strive to do just that knowing that only the sound itself will provide an adequate eloquence

Maybe its something to do with one's recognition of an aspect of truth when he meets it, even if he cannot find the right words to acclaim it.

RECORD REVIEWS

HAYDN Quartet No 39 in G major, Opus 33, No. 3 (The Bird); Quartet No. 78 in B flat major, Opus 76, No. 4 (Sunrise). Played by the Quartetto Italiano Columbia 330CX. 1383.

I often wonder just how these distinguishing names are worked out I can only suggest that, if they be used at all it should be for identification only for many are misleading and often provide a bias in the mind which, in seeking to find justification for them, loses its full enjoyment.

In Haydn's case he wrote such a large number of quartets that he repeated himself in many keys, and maybe a name is easier to remember than a number

These two betray their chronology quite clearly; 39 has a freshness about it which we don't find in 78

The Italians play this latter at rather a steady pace, delicately and carefully In the last movement, for instance, a brighter mood would have been in order, although they become brisk enough at the finish.

It is rewarding music, with more than a touch of the earlier Beethoven, although the impression soon dies on the practised ear

The similarity and distinction is ever more marked in the earlier work, particularly in the adagio

This movement is a good example of the Quartet's style—classical and fine, almost thin at times, devoid of any heavy romanticism or unduly exaggerated tempo

The Rondo which follows shows their excellent ensemble and technical mastery

They are not a full-blooded combination—the final bars of this movement do not end with a flourish to give an air of finality.

No doubt their justification is that the music is written that way!

The recording is sharp and clear not overmuch body, but amenable to some top cut and bass boost Here and there the leader's intonation is uncertain but not enough to spoil the effect

A quiet surface allows full appreciation of some exquisite quiet passages played with beautiful control

CHOPIN—Sonata No. 2 in B flat minor, Opus 35; Sonata No. 3 in B minor, Opus 58. Played by Julius Katchen Decca LXTA 5093

Katchen is not a traditional Chopin player by any means. He takes hold of the music as though he intended to really do something with it, but too often invests it with [illegible] which are hard to justify.

In fact, some sections of the score are difficult identify, but, to be honest, they are not easy to make much of in any repertoire

But his firm handling and controlled emotions might well go down with those who don't like their Chopin sketched too lightly His are powerful performances

At the same time, Chopin is an elusive composer, and the harder one tries to nail him down, the more often he avoids the hammer

Unless the music is allowed to make itself, it often fails to emerge at all Katchen divides his time largely between declamation and fussiness Often he rattles off an episode as though his main purpose is to get it out of the way He is much preoccupied with his own playing.

As expected he makes a big thing of the Funeral March a strange Chopin interlude, and plays the fast display passages with firm authority

The piano tone is convincing, its acoustics well placed and it sounds impressive

MILSTEIN MINIATURES — Thirteen small pieces for violin and piano played by Nathan Milstein accompanied by Leon Pommers Capitol P-8339

Many favourite shorter pieces for the violin are included on this record, most of them arrangements such as Chopin's Nocturne in C sharp minor, Vivaldi's Siciliano, Flight of the Bumble Bee Meditation from Thais, and so on.

Milstein is a lovely violinist, sensitive to a degree, brilliant without being flashy, and with an intonation as steady as a rock

He is also a very heavy breather and it doesn't take very close listening to

THE BEST COMBINATION

in the Chain of

Custom Built, High Fidelity, Home Music System Equipment

ORPHEUS

TRANSCRIPTION TURNTABLE

AND

M.B.H.(Harris)

WIDE RANGE PICKUP

The heart of any music system

☆

SEE AND HEAR THIS REMARKABLE COMBINATION AT OUR PREMISES

ORPHEUS 12" TURNTABLE £28/16/6

M.B.H. (HARRIS) 12" PICKUP with LP Sapphire Head £14/15/6

78 Std Sapphire Head £8/13/6

Diamond Styli for LP or 78 Heads £10/-/-

M.B.H. 14" & 16" ARMS ALSO AVAILABLE

Write for specifications on these two fine Australian made products

☆

The House of Quality Products

WILLIAM WILLIS & CO PTY LTD.

428 Bourke St., Melbourne, C1.

Phone MU2426

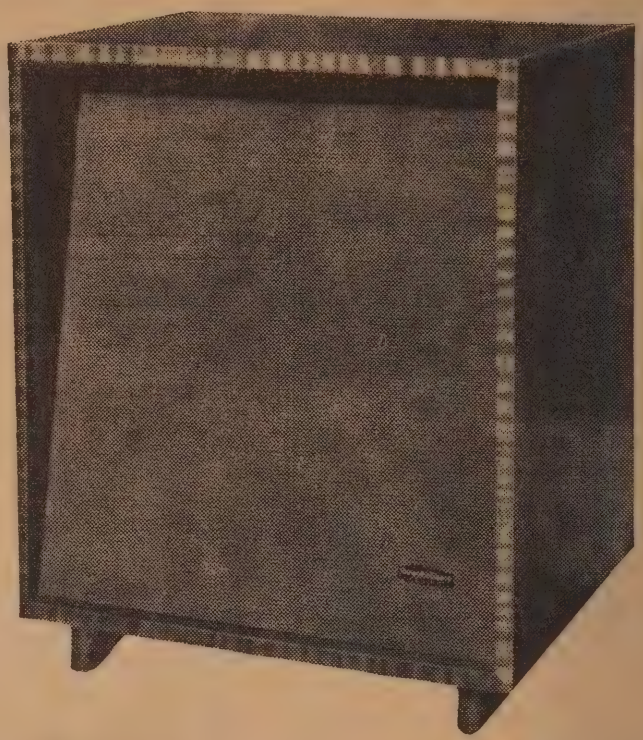
Whether you BUILD or BUY– see U.R.D. for HI-FI

Sherwood A.R.U Cabinet

incorporating the Acoustic Resistance Unit

Bass response of a 35cps resonant speaker extends to 20cps when installed in this cabinet. The loudspeaker cone is air loaded to zero frequency, thus reducing harmonic and intermodulation distortion due to excessive cone displacement. Size 23½ x 27½ x 20½.

Send for information on the Goodmans A.R.U. together with drawings of this cabinet.

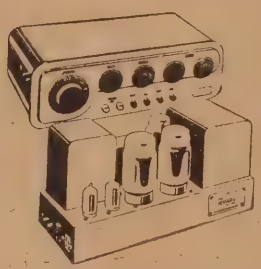


ELECTRONIC A&R EQUIPMENT

ULTRA-LINEAR TRANSFORMERS
MULLARD 20 WATT MATCHED KIT
Output Power Choke
921 1783 10H
MULLARD 5/10
Type 2505
12 Watt 6600 CT

PICK UPS

CONNOISSEUR MARK 2 MBH
GOLDRING 555
VARIABLE RELUCTANCE



Quad II Acoustical Amplifier and Quality Control Unit, £113/12/6.

QUALITY CONTROL UNIT
Available as separate unit to feed your home built amplifier, £53/2/9

TRANSCRIPTION MOTORS

LENCO CONTINUOUSLY VARIABLE SPEED 16-80 RPM

LENCO MOTOR
Available with or without Goldring variable reluctance pickup.

GARRARD — CONNOISSEUR —THORENS
Subject to Import restrictions.

QUAD A. M. TUNER. Early release. Approx. £30 **QUAD** F. M. TUNER. Six valves and tuning indicator. £56/16/

U·R·D

UNITED RADIO DISTRIBUTORS PTY. LTD.

175 PHILLIP STREET, SYDNEY. Phone BL3954, BW3718

hear his pants behind the music.

The recording is sharp and forward — I found a notch of treble cut a good thing to take some shrillness off the top.

I think you will like the way in which he changes his mood to fit the music, and the even balance he achieves with his accompanist.

A good example of this is in the Sicilienne of Maria Theresa von Paradis. Milstein does this kind of thing very well indeed.

The surface is inaudible.

TCHAIKOWSKY — Piano Concerto No. 1 in B flat minor, Opus 23. Played by Paul Badura Skoda and the Philharmonic Promenade Orchestra, conducted by Sir Adrian Boult. Nixa NCL16013.

A low tension performance, analytical to the point of pedantry at times, played carefully and conscientiously, particularly by the pianist, who is neat rather than weighty, correct but not fiery, and, let's face it, not powerful enough to match the strong performances we have heard on other discs.

The Philharmonic Promenade Orchestra is probably the London Philharmonic under another name, but it doesn't sound quite as well as on other occasions, if my guess is correct.

It tends to wash out in the light passages.

Some if its instrumentalists, particularly the brass, are allowed to play roughly here and there.

The piano is well to the fore, which is just as well, for it doesn't get there by brute force. Some of its heavier notes don't come through cleanly by today's standards.

The slow movement has some effective movements but even here the tone is rather thin although some bass boost helped it out.

I'm afraid this effort is a pale one when stacked up against the field.

DEBUSSY — Apres-Midi D'un Faun, Iberia, La Mer. Played by the Detroit Symphony Orchestra conducted by Paul Paray. Mercury MG50101.

Outstanding on this disc is the clearly etched sound. That's the best description of it, for its definition is quite remarkable.

It is one of the things that makes Afternoon of the Faun so successful.

This is one piece which demands the clearest possible articulation from every participating instrument. And no concert hall ever presented them as delicately as Mercury has here.

It is, in fact, an extremely good version from this point of view, although, as with most American discs, a little less presence and a little more air would have put the seal upon it.

The same general story goes for the other two items. There is probably not a cleaner La Mer on records at the moment, and if there isn't all the magic the music contains, there is fine articulation and extreme brilliance.

But it's the delicacy of the recording which is always most noticeable — the tiniest touch of a triangle, almost 3-D in its sonic placement, the sparkle on instrumental tone, the edge on the woodwind and firmness of the tone which excites the admiration.

The surface is beyond reproach — as I have so often remarked we expect this kind of engineering today, and what a difference it makes to a performance of this kind.

On all counts, this disc scores highly.

WALTER'S BRAHMS IS HIGHEST QUALITY

BRAHMS—The Four Symphonies. Played by the Philharmonic Symphony Orchestra of New York, conducted by Bruno Walter.—Coronet.

These discs were released some time ago under another label, but as the originals were American Columbia they now revert to Coronet, who have reprocessed and re-issued them in a handsome, spiral-bound album.

The album also contains the front pictures and back annotations of the jackets normally supplied with single discs.

All this makes a tempting package, for these Walter versions of Brahms are among the best there are.

Walter is one of the last of the old classical school, and he makes this clear at the first bar.

He is completely at variance with those who modernise Brahms, tightening up his meandering ways, shining their batons on his mighty climaxes, and generally doing him over with supergloss.

The truth is that Brahms was a romantic and at times woolly-minded man, and most of his symphonies is touched with rosy glow.

If you do not approach them in this light you will grind much of the substance out of them.

Walter errs, I think, in his own romanticism, and relies upon it too heavily. Among many examples is the second movement of the Second Symphony, in which those long, undulating passages could have been handled with less prolixity without prejudice to the lovely sound he makes.

And the opening of the Fourth is far too slow.

You will probably look, too, for stronger climaxes, as in the end of the First Symphony.

But his feeling for the graciousness and gentleness of Brahms is there. Listen to the third movement of the First, how he handles each phrase as though reluctant to leave it—we can almost hear his sigh of nostalgic regret as the last notes die away.

Walter does not appear capable of reaching moments of real tension or high pitch. I feel that he hits them with pulled punches, when the addition of some real fire might have been electrical.

But these somewhat analytical remarks cannot lessen the fine qualities of these records. Not the least is their technical quality despite some lack of the brighter tones of today.

I liked the distribution of weight and instrumental tone. Brahms must have an orchestra that sounds big even when few instruments are playing; an inner definition to avoid muddiness, and the right reverberation or it will sound thin.

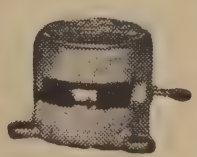
In these respects, both orchestra and recording are most un-American, and in this case better for it.

Already I have considerable affection for these performances, and after all that's strong recommendation. Such records will never stand neglected.

They are perfectly clean and have no noticeable surface noise.

ULTRON 15 series

TAPE HEADS *Extraordinary*



FEATURING:—

★ Extreme Frequency Range.
(20 cps to 20,000 cps. at 7.5 ins. per sec.)
(20 cps. to 30,000 cps. at 15 ins. per sec.)
★ Triple Magnetic Shielding (—30dB at 50 cps.)
★ High Output.
★ Micro-aligned Gap (record and play with separate heads with no treble loss).

THE ULTRON 15 series are recommended for:—
★ Professional Transcription.
★ All Laboratory Uses.
★ Full Frequency Reproduction of Pre-Recorded Tapes.

By far the most advanced range of tape heads available, the ULTRON 15 series is produced in the following types:—

ULTRON 15, ULTRON 15T, ULTRON 15L Record-Play, high impedance, .0001/in gap
ULTRON 15H, ULTRON 15HT, ULTRON 15HL Record-Play, medium impedance .00017in gap.
ULTRON 15S, ULTRON 15ST, ULTRON 15SL High-Efficiency Record. 003in gap
Note—"T" denotes standard half track; "L" denotes lower half track. All others are full track.

SEND 4/- POSTAL NOTE FOR BOOKLET "MAGNETIC TAPE HEADS." containing full specifications of all L B Products' tape heads, Hi-Fi Tape Circuits, etc
A FREE COPY IS SUPPLIED WITH EVERY HEAD.

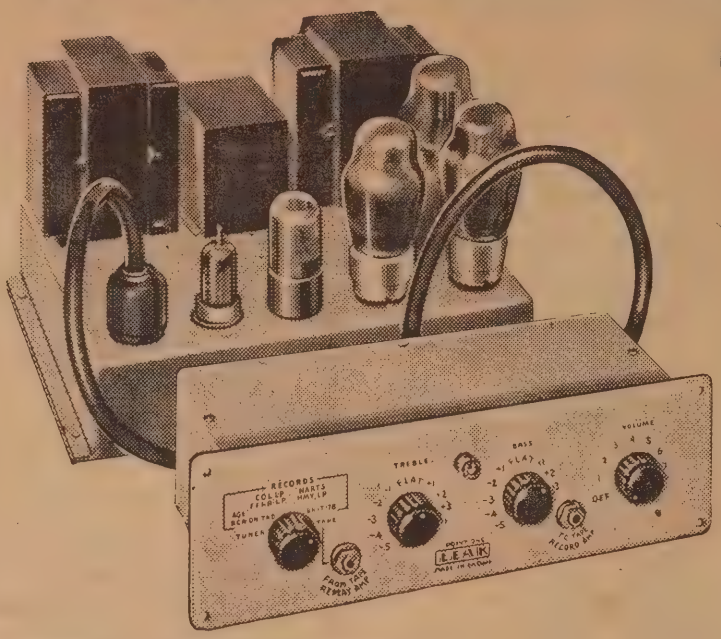
Retail Prices: ALL ULTRON 15 series **£9/13/9**
Types HE2, HE2T (record-play, commercial quality) .. **£6/ 3/-**
Types EU, EUT, EUL (high efficiency erase) **£5/ 7/-**

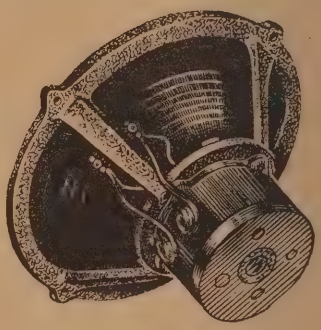
Available from:—

Victoria:—Homecrafts Ltd., 290 Lonsdale St., Melbourne.
S. Aust.:—A. G. Healing, Ltd., 58 Flinders St., Adelaide.
Queensland:—A. E. Harrold Ltd., 123 Charlotte St., Brisbane.

MANUFACTURED SOLELY BY LB. PRODUCTS, 95 McDONALD ST., MORDIALLOC, S.12, VICTORIA. PHONE XY1596.

A Combination that cannot be bettered *at any price..*





LEAK

TL/10 Amplifier & Point One Pre-Amplifier

Wharfedale

Super 12" CS/AL Loudspeaker ★

LEAK

MK II Pick-up with Interchangeable Heads

The Quality of Leak and Wharfedale Equipment is making headlines the world over and is making it one of the Best Sellers.

The motor-board has been cut away to show the simplicity of mounting

Also now available:

The World-Famous LEAK TL/12 Amplifier, with the completely NEW 'VAR SLOPE MK. II" Pre-Amplifier!

For all further Information we suggest you contact your Radio Retailer.

SOLE DISTRIBUTORS FOR AUSTRALIA

MF 8211 **Simon Gray** PTY. LTD. MF 8166

RADIO DIVISION

28 ELIZABETH STREET MELBOURNE C1

★ Also recommended as THE ULTIMATE Wharfedale Twin—and Three Speaker Systems

CHADWICK. — Symphonic Sketches; Jubilee, Noel, Hobgoblin and A Vagrom Ballad. Played by the Eastman-Rochester Symphony Orchestra, conducted by Howard Hanson. Mercury MG50104.

Chadwick was of the school of American composers which flourished in the latter half of the last century along with Ives, McDowell and Paine. He was a director of the New England Conservatory, the home of serious American music, for nearly 35 years.

As might be expected, much of his music showed the influence of Dvorak and of Brahms, for not only was Dvorak a prominent figure in New York at the time, but Chadwick, in common with most musicians of the day, finished his studies in Germany, and the combination must have been irresistible.

This influence is most prominent in the first two sketches, written some years before the last two, and the change in style between them is most marked. Jubilee and Noel are the most often played because they are the most tuneful and concertwise. They are, in fact, well worth a place in any program.

Hobgoblin and Vagrom Ballad seem experimental by contrast, as indeed they were, and many American composers who came under Chadwick's influence followed similar lines into brave colour and effects.

The Eastman-Rochester Orchestra always puts on a brilliant show, which Mercury's recording technique is designed to accentuate. I thought it rather unbalanced at the top end, and preferred to play it on the old E.M.I. curve, with some extra bass, to tone down the highs and add more body. Despite the claims made on the jacket, I did not think many important passages for individual instruments were picked out as well as they deserved, although everything which is there is very clear.

And many weighty bits, played at good volume, are of demonstration standard.

BRAHMS.—Symphony No. 4 in E Minor Opus 98. Played by the Vienna Philharmonic Orchestra, conducted by Rafael Kubelik. Decca LXTA 5214.

This is a fine performance of the Fourth, a contrast in many ways with that of Bruno Walter but comparable as a successful effort.

Kubelik treats the music more urbanely, less analytically than Walter—it moves more quickly even when there is little actual difference in tempo.

Its outlines are not quite so completely filled out. Kubelik's conception is a broader one, and his texture more tightly bound together.

As might be expected, his excitement has the greater heat, although the actual recording is more remote.

The players, too, have their own smooth quality of tone which is not easy to mistake, although, as I have said, Walter's players sound quite unlike the sharp American fashion.

It is, in fact, an extremely fine performance—among the best of a good collection.

There is more top to it than there is with Walter, although the cutting amplitude isn't as high. Volume for volume, it shows signs of having been made at a later date.

The surface has the faintest of rustles, just enough to prevent it from being dead quiet.

MENDELSSOHN — Piano Concerto No. 1 in G Minor, Opus 25; Piano Concerto No. 2 in D Minor, Opus 40. Played by Peter Katin and the London Symphony Orchestra conducted by Anthony Collins. Decca LXTA 5201.

The concertos of Mendelssohn are patchy things. They combine an air of simple sincerity with some beautiful melody; they mix his stylised and often inadequate handling of the orchestra with some passages of great banality, and tiresome pre-occupation with poor ideas.

But they are things one comes back to occasionally with untroubled enjoyment —they create an atmosphere of pleasant well-being it is hard to define.

Perhaps it is because one can idly think of other things while listening in ruminative mood without danger of missing anything highly important.

By no manner of thought can they be described as demanding music. Peter Katin strikes just the right atmosphere in his clean, graceful performance. If he can't prevent the music from sagging occasionally at least he keeps it going, nor does he draw attention to its limitations by an over-ambitious delving for what is not there.

Collins' orchestra plays in much the same vein, very nicely, too, and if his tempos sound wooden at times it may not be altogether his fault.

In short, Mendelssohn here is dealt with adequately, and even with distinction, and the recording has made sure it is all clearly audible.

One can hear the piano hammers bounce very smoothly from the strings, and only occasionally does the tone run a little hardly.

Only real criticism is that my copy has a faint surface swish on each side, which may not be characteristic of them all.

GALUPPI—Quartet in G Minor. BOCCHERINI—"La Tiranna Spagnola," Opus 44 No. 4. CAMBINI —Quartet in G Minor. Played by the Italian String Quartet. Columbia 330CX 1408.

There is a vast amount of chamber music which today is never played and, apart from its historical value, no doubt it isn't very much missed. The universal appeal of orchestral music has pushed even the better-known quartets into the background, which makes it even more surprising to strike this disc among recent releases.

Galuppi was born in 1706, Boccherini in 1743 and Cambini in 1746, all in Italy. Galuppi is the most serious-minded of the three and we are not surprised to learn that he was much admired for his craftsmanship.

There is a great difference between his scholarly and rather pedantic style and the more facile work of the younger pair, whose work has much in common.

It was, in fact, a habit of Cambini's to compose in the style of Boccherini and have his compositions published as the real thing.

No doubt his adventurous life and scapegrace tendencies had blunted his scruples about such matters.

And yet his own quartet here is the longest and the most satisfying of the three.

As all the music and two of the composers are new to me I can only say that the Italian players handle their performances in their usual distinguished style and that the recording is much the same as we have from them in records already released.

AWA RONETTE

MICROPHONES & ACCESSORIES

Type TO-284

£2'15'3

Turnover pickup cartridges for standard and long play. Available in Alternative response characteristics as models OV. P. T. TS.

CHANDLERS PTY. LTD.

Albert & Charlotte Sts., BRISBANE.

RADIO DEALERS & SERVICEMEN

We specialise in Radio Parts and stock all reliable brands, including Resistors, Coils, Condensers, Speakers, Valves, etc.
We can supply 3-speed Record Changers, 3-speed Players, Cake Mixers all types Pickups, Pickup Heads, Mantel Sets, Portable Sets, Radiogram Sets, Cabinets, Elec. Lawn Mowers, Polishers and Vacuum Cleaners, Testing Equipment, Radio Manuals, Electric Irons and Toasters, Pressure Cookers, and Electrical Parts, Television Accessories.
We give you personal attention and service.

Sher electric drills and accessories.

Black and Decker products.

DAVIS RADIO CO.

Wholesale Radio Distributors

1st Floor Wembley House, 841 George St., Sydney.

Phone BA3917 Open Saturday Mornings

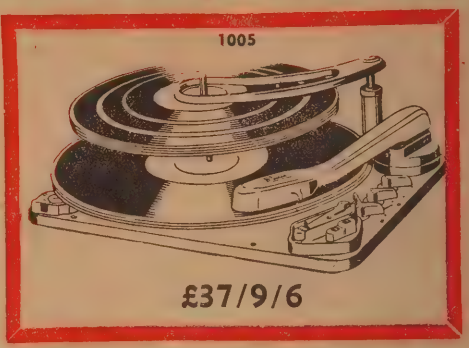
Dual

— Present —

THE LATEST DUAL DEVELOPMENTS

MOD. 1005 CHANGER—4 SPEED

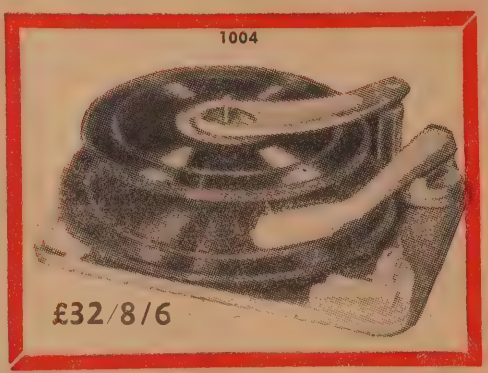
Push-button control — automatic needle selection—scratch filter—pause switch (to control spacing between records)—repeat switch and emergency stop control. Plays automatically all records up to 12" diameter.



£37/9/6

MOD. 1004 CHANGER —4 SPEED

A new addition to the Dual range, an easy to operate automatic changer with push button control. Thoroughly reliable and maintaining the same high quality and performance of other Dual products.



£32/8/6

PICKUP

All models are supplied with the wide range crystal cartridges (CDS2-CDS3) with twin sapphire needle assembly. For the microgroove enthusiast twin micro. sapphires or Diamond Assemblies can be supplied if desired.

£18/10/-

MOD. 295 — 4 SPEED MANUAL PLAYER

Fitted with automatic cut-off. Ideal for "building in" where space is limited or for use as a portable as illustrated at right.

£24/15/-

Players and Changers are assembled, marketed and serviced by:

Dual

FRED A. FALK & CO PTY. LTD.

28 KING STREET ★ ROCKDALE ★ N.S.W. ★ AUSTRALIA

TELEGRAMS & CABLES: "GRAMOFALK, SYDNEY" ★ PHONE: LX 4783

You'll need a PLATTERBACK

COOK TEST RECORD IS UNIQUE

IT isn't normally possible to make distortion measurements on audio equipment without special test gear, and even then, a reliable, quick checking method isn't easy to find.

Most frequently used is the intermodulation test for, besides being the simplest to observe, it indicated to some degree the presence of other distortion forms, and even their magnitude, for in the final analysis all types of distortion are inter-related.

Emory Cook's ingenuity and ability as an engineer are both reflected in his N-A Beam test record, for detecting the intermodulation distortion of a complete audio chain centred around a figure of 2 per cent.

On this disc he has recorded two tones, one gliding from 20,000 to 4,000, and the other from 19,000 to 3,000 cycles simultaneously in the same groove. Because these tones are always separated by 1,000 cycles, any non-linearity in the system will produce not only the two tones, but a third tone of 1,000 cycles, the difference frequency between them. The greater the degree of non-linearity, the louder will be the 1,000 cycle note.

And, because non-linearity is the cause of intermodulation, the presence or absence of the third tone is a direct check.

A DIRECT CHECK

So that the amplitude of the intermodulated note can be estimated, Cook has superimposed on his recording a coded 1,000 cycle note at an amplitude equal to 2 per cent. distortion product. The code is in the form of the dot-dash representing the Morse Code letter A.

With no distortion present, the listener will hear this succession of "A's" throughout the disc, together with the gliding tones when these fall within the audible range.

If there is distortion, the intermodulated note will begin to fill up the gaps between the coded signals. If it should exceed 2 per cent., it will overshadow them, thus turning the dot-dashes into dash-dots, the Morse Code symbol for the letter "N." If distortion should exactly equal 2 per cent., a steady tone will be heard, at 1,000 cycles.

FINE RECORDING

The record pre-supposes a very low degree of distortion during recording, and the fact that the technique succeeds at all is a direct evidence that Cook's gear is high-class.

A check on several amplifier systems was sufficient to show that the disc is a useful test, for results were varied and easily recognisable. I was, in fact, quite impressed by the monotonous regularity with which "A" was produced on my own gear. Only at one small spot around 14 Kc did it show any tendency to convert to "N," and, according to the jacket note, the distortion in recording at this point is only 3 db under reference, againts a normal minimum of 10 db.

One side has two such tracks at 33 r.p.m., with explanatory notes spoken by Bob Bollard of Cook's, together with a third inner section recorded at 78 r.p.m. microgroove. This speed change allows a cross check to be made should there be any suspicion that the record itself is at fault.

The second side duplicates the first, but is intended for binaural tests using Cook's twin channel records.

OVERALL TEST

Note that this is an overall test, covering pick-up, amplifier and speakers. By a process of substitution, it is often possible to track down which section is the offender. It is particularly useful for pick-ups and speakers, both of which are most difficult to analyse, even for experts.

The disc would have been even more useful if the second side had been a duplicate of the first, or combined with a frequency run. Maybe the manufacturers can be persuaded to do something about it at some future date.

In the meantime it appeals as a most valuable and unique method of test.

KHACHATURIAN. — Concerto for Piano and Orchestra, played by Leonard Pennario with the Concert Arts Orchestra conducted by Felix Slatkin. Capitol P-8349.

The sound is particularly bright and sharp—no furry edges here, cracked piano notes or fluffy cymbals. It is brilliant to the point of hardness, for Capitol has kept the upper and middle registers well to the front, to the detriment, I think, of the heavier and rounder sound.

To a large degree this treatment is not out of place, for except for the romantic slow movement, the musical outlines are sharp edged and often harsh.

I rather liked this description of it contained on the record jacket.

ROMANTIC TRADITION

"The concerto is in the grand romantic tradition that stemmed from Liszt and had a gorgeous flowering with Tchaikowsky and Rachmaninoff. Technical virtuosity is the hallmark of the tradition, and Khachaturian is not reticent; he thunders up and down the piano with fine authority, embroiders his melodies with fantastic arabesques to show off the facility of small-muscled fingerwork, interpolates cadenzas, frames the solo part with highly coloured orchestral sounds, builds sonorous climaxes — in short, sets up a musical economy which requires a large investment of physical energy but which also pays enormous dividends."

In general, all these things are present in this record. Certainly the pianist is most brilliant, with the breath-taking speed and certainty so characteristic of American performers. He is inclined to personalise the part whereas I see no personal feelings in this music. It should be played from the outside, and not the inside, its emotions, such as they are, are those of a spectator and not a participant.

The orchestra sounds loud but not big, apparently fairly closely miked in a hall with ample reverberation.

ANTAL DORATI

conducts the

MINNEAPOLIS SYMPHONY ORCHESTRA

ANTAL DORATI

TCHAIKOVSKY 1812

FESTIVAL OVERTURE

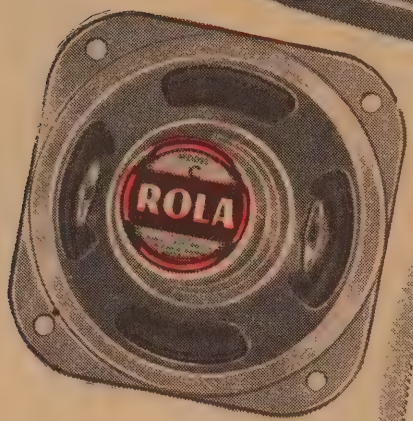
ON

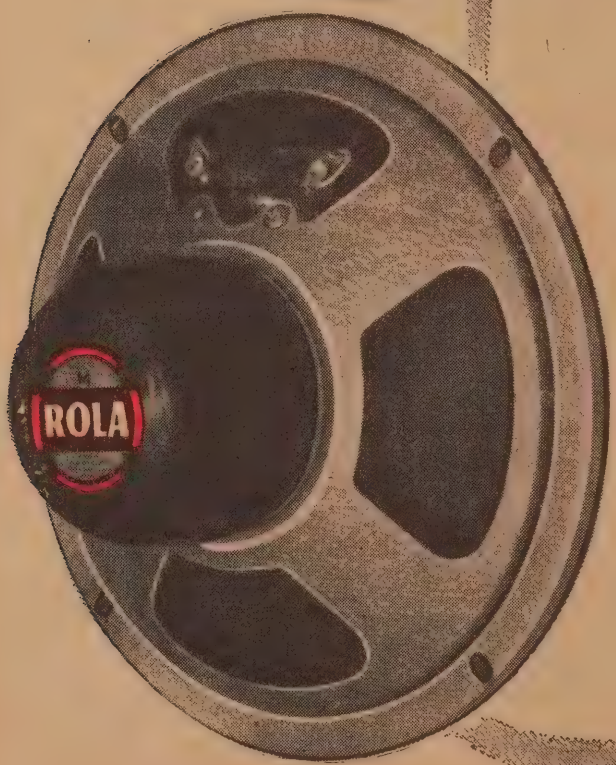
Mercury

This recording contains a track used solely for the explanation of how the live cannons (to simulate the Franco-Russian battle) and the bells of Harkness Memorial Tower, Yale University (to simulate the Russians' victory over France), were recorded and dubbed into the music, at the required time. This spoken commentary is by Deems Taylor. On the reverse side of this disc is a beautiful recording of CAPRICCIO ITALIEN, also recorded by Antol Dorati and the Minneapolis Symphony Orchestra. MG50054 12in L.P. 57/6.

Pressed by the manufacturers of ASTOR *Quality* Radio, Radiograms, Television and Appliances.

The TV Pair





These two new Rola loudspeakers, Models 6M and 3C, are particularly suited for use in table model TV sets where space is at a premium, yet adequate facilities must be provided for the extended range reproduction available from TV's frequency-modulated sound channel.

Both new speakers incorporate the famous Rola "Fluxmaster" principle which eliminates the stray magnetic fields which can distort the TV picture.

The response of the high efficiency 6M takes care of the low and mid frequencies while the conveniently sized 3C can be front-mounted to provide top response and forward-projected sound which gives "presence" and perspective to the TV set's audio.

ROLA COMPANY (AUST.) PTY. LTD.

THE BOULEVARD, RICHMOND, VIC. JB3921. 116 CLARENCE STREET, SYDNEY, N.S.W. BX3996.

FALLA — Three-Cornered Hat Dances; PROKOFIEFF — Suite from the Chout Ballet. Played by the St. Louis Symphony Orchestra. Conducted by Vladimir Golschmann.—Capitol P8857.

The performance of the Three-Cornered Hat Dances are notable more for their vigour than their style — the conductor plays up effects rather heavily. The recording is bright — the strings have a forward edge, the drums are hard. The net effect is reasonably neat but rather noisy.

The Prokofieft is to my mind much more successful. It may, in fact, be the only recording yet released, and is a Suite from a Ballet of the same name.

Chout is the French rendering of the Russian word for Buffoon, and the story is a Russian folk tale of magic and understanding, fantastic in conception and earthy in execution.

There is little that can be said of the music that does not apply to Prokofieff in general. There is the same sharp-edged wit, contrasting and economical tonalities, and pointed satire.

The recording is rather better than on the reverse side, and I get the impression that this is the kind of music the orchestra likes best to play.

Surface is good—a little bass re-inforcement might improve the sound.

LISZT.—Concerto No. 1 in E Flat Major; Hungarian Fantasia. Played by Geza Anda and the Philharmonia Orchestra, conducted by Otto Ackermann. Columbia 330CX, 1366.

Anda's gentle treatment of Liszt was not unexpected, remembering the virtues of his past performances, but it does sound most unusual when compared with the powerful brilliance most pianists strive for.

Most of his attention is given to the many quiet melodies of both works, which he extends to the limit in both time and mood.

The orchestra, on the other hand, answers the piano with great zest, as though its role has been tempered to contest the quietest piece of Liszt playing I have heard in a long time.

I think you will have to like deft, closely analytical performance to really enjoy this one. Somehow Liszt without the flash and the fire and the bluster can sound rather empty and dull.

Anda is always a fine pianist, and he has no difficulty with the mere technical problems. He makes the romantic passages sound smooth and lovely.

But he isn't a traditional Liszt exponent.

The piano is heard extremely clearly and the orchestra complements its part without impatience.

If you are looking for Liszt with a difference, this is it.

VERDI OPERATIC RECITAL.—Selections from Un Ballo in Maschero, La Traviata, La Forza del Destino, Aida, Falstaff and Il Trovatore. Sung by Joan Hammond with the Philharmonia Orchestra conducted by Glauco Curiel. HMV OALP 1407.

This is the most successful record of Joan Hammond's so far issued.

Her vocal control seems to have vastly improved during the past year or two. She still retains that fierce acceleration to full voice which can be so disconcerting and which in the past has rendered her singing a thing of fits and starts, with little colour or subtlety in between.

But there are times as, for instance, in the selections from Aida, when she judges her tones extremely well, and although they do not achieve that fineness which comes more naturally to a lighter voice, they are steady and convincing.

Theatrically, she is now more animated; her emotions sound more as though she felt them and less as though she had made them up.

I say these things gratefully, for in the past I have not been able to enthuse over her records. If you are already a Joan Hammond fan, you will welcome this disc as a minor masterpiece.

Once again the Philharmonia Orchestra proves a tower of strength. There are too many fine moments on its part to list them all, but listen particularly to the violins at the commencement of the Traviata aria.

On records, at least, this is the best of Joan Hammond.

OPERATIC ARIAS VOL 2 — Selections from Mozart, Cilea, Catalani, Mascagni, Rossini and Refice. Sung by Renata Tebaldi and the Orchestra of the Academia di Santa Cecilia, Rome, conducted by Alberto Erede.—Decca LXTA 5220.

Any record of famous arias sung by possibly the leading operatic soprano of the day is bound to be good. All these appear to be excerpts from complete recordings, and they give a good cross section of Tebaldi's repetoire.

Not all will be as familiar as the Porgi Amor; E Susanna non bien; and Dovo sono from the "Marriage of Figaro," but they are all sung just as effectively with that quality which can only be termed peerless.

I am a Tebaldi fan. I am always ready to listen when she sings as beautifully as she does here, and is as well recorded.

AWA RONETTE

MICROPHONES & ACCESSORIES

Type R572
£19/3/3
(High impedance)
Type
R572/L
£25/3/3
(low impedance, 200 ohms) duo cell omni-directional
Other types also available from

NEWTON McLAREN
17 LEIGH ST., ADELAIDE.
(and leading wholesalers)

A SPECIAL NEW
T.V. FILTER

made by
AEGIS

Type LF-1TV Aegis Power Lead TV Filter designed to filter out electrical interference at television frequencies.

Rating: 240v 2A max (500 watts).

Tested under exacting conditions and proved thoroughly reliable and efficient. Price 40/-.

Ask to see it at your local Aegis dealer's or write direct for details.

AEGIS MFG. CO. PTY. LTD.
208 LT LONSDALE ST., MELB. FB3731.

MAKE POUNDS A WEEK

in spare time or start full time business. Many making £20, £30 and £40 a week. Write for details of Guaranteed Money-Making Plans. J. O'Rourke, Director Profitable Enterprises (regd.), Dept., RH. Box 5070 G.P.O., Sydney

How MUCH Do You Really Know About
RADIO?

STOTT'S Course meets the exact needs of Amateurs, Radio Salesmen, Experimenters, Dealers, Service Men, Builders of Sets, and others. This Popular Course has been designed and prepared by Experts

A Student wrote: "I am taking this earliest opportunity of thanking you for your splendid Radio Course. It has proved invaluable to me in my work."

Write today, without obligation, for particulars of the STOTT COURSE IN RADIO FOR AMATEURS.

Stott's Correspondence College

100 Russell St., Melbourne; 149 Castlereagh St., Sydney; 290 Adelaide St., Brisbane; 21 Grenfell St., Adelaide; 254 Murray St., Perth

CUT HERE & POST

To STOTT'S: Please send me, free and without obligation, full particulars of your HOME-STUDY COURSE IN RADIO.

My Name .....

Address .....

R.H.857 ..... Age .....

Printed and published by Sungravure Ltd., at the registered office; 21-29 Morley Avenue, Rosebery, N.S.W.

SHORT-WAVE NOTES BY ART CUSHEN

HCJB CELEBRATES 25 YEARS

A first-hand insight into the progress of HCJB in Quito and the plans for this station in the future were gained in a recent interview.

THE past and future of HCJB was outlined to us when Mr. Frank S. Cook, of Radio Station HCJB, Quito, visited Invercargill recently. From the information gathered a fine picture of the work of the station, which has a mail response from listeners of nearly 1,000 letters each week, could be obtained.

TRANSMITTERS

The stations is now using a new 50,000-watt transmitter, and this can be cut to use two frequencies, and present indications are that the transmitter has been increased somewhat to now give some 40,000 and 20,000 watts respectively. The two transmitters can be worked in the 16 and 25-metre band in parallel, or in the 19 and 31-metre band in chain.

Four other 10,000 watt transmitters are in use, and one of these is in the 49-metre band, and the other taking the frequencies not covered when the 50-or 40-20 Kw stations are not using the frequencies.

The old 10,000-watt transmitter, which has been in service since 1940, has been dismantled and is now being converted into a new 50,000-watt station. This will operate on the broadcast band frequency of 700 kilocycles and also on the shortwave channels.

TRANSMITTING SITE

The transmitting station at Pifo occupies some 45 acres and is shaped to give maximum use of the area for the antenna layout. The masts are about 300ft high, and one of these is visible in Quito. It houses the F.M. link with the studios

STUDIOS

The studios occupy a city block in Quito and are connected to the transmitter by three F.M links, these carry the two programs, Spanish and the overseas service, and the other provides communication facilities, the station having an intercommunication system connecting some 100 points.

The large studio has modern acoustic treatment and there are several smaller studios for announcing. The studio also has a room housing F.M. receivers and a small 500-watt transmitter used for the Spanish programs and for official Government information broadcasts to the area the Government relying on HCJB for help in this direction.

STAFF OF 200

The station has a staff of close on 200, including 87 missionaries. Broadcasts are for 24 hour a day, except on Monday, which is the Tuesday reception in this area. The station also supplies the villages with small 4-tube, pretuned receivers and runs hospitals and other services for the community. Since the increase in power it has met with tremendous listening response in this area and New Zealand, on a population basis, must rank as one of its main areas of listeners.

The station in the future plans to operate from Europe, but as most countries do not have commercial or sponsored programs, the field is very limited.

Monaco, Luxemburg, Saar and Tangier, in North Africa, are the only fields available, and the construction of a transmitter to cover this vast European audience would be a major step.

Listeners' letters to HCJB are welcomed and many are answered in the Program Note session on Saturday at 5.15 p.m. on 9,754, 11,915 and 15,105 Kc. The station operates on these frequencies from 4.30-8.0 p.m. in the Southern Cross Salute, directed to listeners in Australia and New Zealand.

ALWAYS RELY ON R.D.S.

R D S Stockists of Television parts, Picture Tubes and Turrets

We can supply all Radio and Electrical Components and are agents for the famous Hotpoint Radio Sets. Distributors of Test Equipment, Valve and Circuit Tester, Multimeters, etc. A Complete Mail Order Service for the Countryman. Call, write or phone to:—

The independent Wholesaler

RADIO DESPATCH SERVICE

Radio and Electrical Distributors,
GROUND FLOOR, WEMBLEY HOUSE,
841 GEORGE STREET, SYDNEY.

Phone MA1876 Open Saturday Mornings

Dux Radio—Tangier

A NEW Swedish commercial station broadcasting from Tangier, North Africa, with programs beamed on Sweden has been heard testing on 9340 Kc from 5 a.m. to 7 a.m.

The signal strength is good and the station uses both Swedish and English in the announcements which are given frequently, while the popular tune, "Swedish Rhapsody," seems to be the musical identification they plan to use. The station has some Morse interference, but strength is of good entertainment value.

The station gives this announcement: "This is DUX Radio, Stockholm, Tangier. Dux Radio is a new Swedish advertising broadcasting from Tangier, North Africa. We would welcome a report on reception of this broadcast in your area and send this to DUX Radio, Stockholm 12, Sweden. We will reply with our station card."

It is expected that regular programs in Swedish will soon be carried on the frequency. As the Swedish Broadcasting Corporation is non-commercial, the station plans to cater for the commercial sponsors from the broadcasts from the International Zone of Tangier.

Notes from listeners should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All Times are Eastern Australian.

Perth on 6130kc

AFTER a lapse of over four years the Perth transmitter of the A.B.C. has returned to 6,130 Kc. It now uses three frequencies in its day's operation, while the lower powered VLW station has broadcasts on two channels. The complete schedule of the Perth service is now 8.00-10.00 a.m. on VLX4 4897 Kc. VLW9 9610 10.15 a.m.-8.15 p.m. Monday to Friday, 10.00 a.m.-8 p.m. Saturday, and 10.15 a.m.-7.15 p.m Sunday, on VLX9 9610, VLW11 11.840; 8.20 p.m 11.30 a.m. Monday to Friday, 8.15 p.m.-2.00 a.m on Saturday, and 7.30 p.m.-1.30 a.m. on Sunda on VLX6 6130 and VLW9 9610 Kc.

Radio Japan

THE transmissions from Radio Japan, in Tokyo have undergone some frequency and transmission time changes and the present operating schedule is as follows:

1.30-2.30 a.m., 11705, 15325 Kc., to India, Pakistan, Ceylon.

3.30-4.30 a.m., 11705, 15325 Kc., Near East.

9.00-10.00 a.m., 17825, 15325 Kc., Eastern North America.

3.00-4.00 p.m., 17795, 15325 Kc., Western North America.

4.30-6.30 p.m., 17795, 15225 Kc., Europe and U.S.S.R.

5.00-6.00 p.m., 17825, 15235 Kc., Hawaii,

7.00-8.00 p.m., 17825, 15235 Kc., Australia New Zealand.

9.30-10.30 p.m., 17825, 15225 Kc., Philippines Indonesia.

12.00-1.00 a.m., 11705, 15235 Kc., Burma, Indo China, Thailand.

7.00-8.00 p.m., 11705, 9225 Kc., South America

Four transmitters are used by Radio Japan, two of 100,000 watts and two of 50,000 watts. The higher power is used in all cases except when two transmissions are programmed at the one time. In the case of the Australian transmission, only 50 Kw. is used, the greater power being used in the service to South America. Likewise in the transmission to Hawaii, 50 Kw. is released, while the higher power is beamed in the service to Europe.

FLASHES FROM EVERYWHERE

NEW GUINEA transmissions from Port Moresby, which is using the frequency of 6130 Kc., the same as the new VLX6 Perth, has been listed by Radio Australia. The station relays the broadcast band station 9PA, 1250 Kc . The full schedule is: Mon.-Fri., 4.00-10.45 p.m.

Sunday, Monday, Tuesday, Wednesday, Thursday, 6.45 a.m.-2.45 p.m.

Friday, 6.35-9.30 a.m.; Saturday 7.45 a.m.-2 p.m.

Saturday, noon-1.00 p.m.; Sunday, 4.00 p.m.-10.00 p.m. The station is using the callsign VLT6 on 6130 Kc.

WEST INDIAN stations in the West Indies Broadcasting Service have been noted in New Zealand with an early schedule on the days of the Test cricket broadcasts of the England v. West Indies matches being played in the United Kingdom. The station is using 4760 Kc., opening at 8 p.m. in a local program and at 8.25 p.m. took a relay from London of the B.B.C. cricket commentary. The dates of the last Test in England is 22 to 27 August.

ECUADORIAN station HC1RP, on 5015 Kc., has been heard by Stuart Morris opening transmission at 8.45 p.m. and at 9 p.m. giving its identification, following classical recordings. The program after 9 p.m. consists of a devotional service with news in Spanish at 9.0 p.m.

BRUSSELS, in Belgium, is the site of a World Fair to be opened next April, and to give the fair world-wide publicity a special program in English is being broadcast by the Brussels station each day except Monday. The transmission to North America is 10.30 to 11.00 a.m. on 17840 Kc and on the usual Brussels frequencies of 11850 and 9660, 15335, while the OTC, Leopoldville transmitter is using the 9655 Kc. transmitter. The program from the Leopoldville relay station may at times use the 17850 Kc. The program is repeated for other areas of the world on both the Brussels and Leopoldville transmitters.

SOUTH AFRICAN Broadcasting Corporation has announced that all shortwave transmissions are now carried on the 20,000-watt paradyse transmitters. The old lower-powered station at Johannesburg has been closed down, and so the lack of signals from the South African area in the past is being gradually overcome. Reports from North America state that the transmissions on and in the afternoons, the 9523 Kc. has been noted at 3.40 p.m. and the program on 7229 Kc. has been heard at 3.30 p.m., and the African service was heard at the same hour on 7275 Kc.

BELGRADE has made some changes in the English broadcasts, reports Cyril Anderson, of Western Australia, who states the news is now broadcast at 4.15 a.m. on 6150, 7200 and 9505 Kc.

TAIWAN signals which have been heard on BED4 11815 Kc., and BED57, 15435 Kc., are again in the English service, and have been heard 10.00-10.30 p.m. at good strength, though there is some jamming on the channels at times.

This is a new transmission to Japan, Korea and Indonesia.

GUATAMALAN station, Radio Nacional, is shortly to increase power to 20,000 watts on the frequencies now in operation for its normal 2.m.-3 p.m. schedule. The station uses 640, 1520, 3180 and 9760 Kc. and is regularly heard in this area on the latter two frequencies.

ADEN transmissions on 7170 Kc. have been revised and the station signs off one half-hour later at 4 a.m., with God Save The Queen.

MONTE CARLO RADIO, broadcasting from Monaco, has made a frequency move and is now using three frequencies, 6035 Kc. for the whole transmission; 7132 Kc. up to 7 p.m. from sign-on 4 p.m., and also after 5.15 a.m.; and on 9735 Kc for the period, 7 p.m.-5 a.m.

SYRIAN signals from Damascus have been heard in New Zealand on 7130 Kc. in English from 4.15 a.m. to 5.30 a.m. News is broadcast at 4.15 a.m. and then a commentary, music of a lighter type is carried from 4.30 to 5.30 a.m.

ARGENTINA has been operating on 9690 with a session in English from 2.00 to 2.50 p.m. and using the L.R.A. transmitter. The old slogan of Radio del Estado has been replaced by Radio Nacional.

CHILEAN station CE960, broadcasting from Santiago, has been heard with a new slogan, Radio Presidente Balmacedo, for its operations on 9600 Kc. The signal shows an improvement in this area, and suggests a power increase.

MANILA station of the Far East Broadcasting Company, using 21515 Kc., has been assigned the call DZI3. The station uses 1,500 watts and has been testing for several weeks and is well received in this area and in Europe. Radio activity in the Philippines has increased in recent weeks and Manila now has some 19 stations on broadcast, many of which have shortwave relays.

THE HAM BANDS WITH BILL MOORE

In memory of their comrades who fell in World War II radio amateurs throughout Australia each August join in the Remembrance Day Contest. It is the best supported of all events conducted by the WIA.

ANNUALLY since 1948 the Wireless Institute of Australia has conducted the Remembrance Day Contest in memory of amateurs who made the supreme sacrifice in World War II.

It is held on the weekend nearest the anniversary of VP Day, August 15, and engraved on the trophy are the names and call-signs of radio amateurs who fell.

The trophy is awarded to the Division of the Institute whose six leading stations amass the highest scores.

Amateurs throughout the Commonwealth and Territories are invited to participate by the WIA in the contest. It provides an opportunity to talk with your interstate ex-service friends and your participation will assist your division to win the coveted trophy — final scores are fixed after an allowance for the degree of activity in the contest in each State.

The rules for the contest are as follow:—

Amateurs in each call area (this includes those in Australian Mandated Territories and Australian Antarctica) will endeavour to contact amateurs in other call areas (VK1 and VK2 are considered to be one call area).

Date — August 17 and 18, 1957. The contest commences at 1800 hours EAST, August 17, and concludes at 1759 hours EAST, August 18.

A period of 15 minutes' silence will be observed by all stations on August 17, immediately prior to the start of the contest.

During this period an appropriate broadcast will be made from VK3WIA and relayed by divisional stations.

Rule 1: There shall be four main sections to the contest—(a) Transmitting phone; (b) Transmitting CW; (c) Transmitting Open; (d) Receiving phone and CW.

2: All Australian amateurs may enter for the contest whether they are fixed, portable or mobile, but only members of the WIA are eligible for awards.

3: All amateur frequency bands may be used, but no cross-band operating is permitted.

4: Amateurs may enter for one of the above sections listed in Rule 1. An open log will be one containing both phone and CW contacts.

5: Only one contact per station per band is allowed and arranging schedules for contacts on other bands is not permitted.

6: Only one licensed amateur is permitted to operate any one station under the owner's call-sign. Should two or more operate any particular station, each will be considered a contestant and must submit a separate log under his own call-sign.

Contestants operating stations other than their own shall be referred to, for the purposes of these rules, as "substitute operators."

Their operating procedure will be as follows:—

Phone Contacts: Substitute operators will call CQ Remembrance Day," followed by the call sign of the station they are operating and the word "log," followed by their own call sign.

CW Contacts: Substitute operators will call CKRD de," followed by the group call-sign comprising the call-sign of the station they are operating, an oblique stroke, and their own call-sign.

Contestants receiving signals from a substitute operator will qualify for points by recording the call of the substitute operator only.

7: Entrants must operate within the terms of their licences.

8: Cyphers.—Before points may be claimed for a contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures is in accordance with usual arrangement for VK contests.

9: Entries must be set out in the following order.—Date and time, band, type of emission, call-sign worked, number sent, number received, points claimed.

One side of the paper only to be used and entries must be postmarked not later than September 7, 1957, and addressed to the Federal Contest Committee, W.I.A., Box 1234 K., G.P.O., Adelaide, South Australia.

10. Scoring will be based on the table shown.

Contacts from VKO to any State, 6 points. Any State to VKO, 6 points. VK2 covers VK1 also.

Contacts from VK2 to VK3, 1 point; VK4, 2 points; VK5, 3 points; VK6, 5; VK7, 4; VK9, 6.

VK3 to VK2, 1; VK4, 3; VK5, 2; VK6, 5, VK7, 4; VK9, 6.

VK4 to VK2, 1; VK3, 2; VK5, 3; VK6, 6; VK7, 5; VK9, 4.

VK5 to VK2, 2; VK3, 1; VK4, 3; VK6, 5; VK7, 4; VK9, 6.

VK6 to VK2, 1; VK3, 2; VK4, 4; VK5, 3; VK7, 5; VK9, 6.

VK7 to VK2, 2; VK3, 1; VK4, 4; VK5, 3; VK6, 5; VK9, 6.

VK9 to VK2, 1; VK3, 2; VK4, 3; VK5, 4; VK6, 5; VK7, 6.

11. All logs shall be set out as shown and, in addition, will carry a front sheet showing the following information:

Name, section entered, address, callsign, score claimed and a signed declaration stating the rules and spirit of the contest have been observed.

12. The right is reserved to disqualify any entrant who during the contest has not observed regulations or who has consistently departed from the accepted code of operating ethics.

13. The ruling of the Federal Contest Committee of the W.I.A. will be final, no dispute will be entered into.

14. Awards: Certificates will be awarded to the winners of the phone C.W., open and receiving sections in each call area (Northern Territory will count as a separate call area). There will be no outright winner for Australia. Further certificates may be awarded at the discretion of the contest committee.

The State to which the perpetual trophy will be awarded to shall be determined in the following way:

To the average of the top six logs shall be added a bonus, arrived at by multiplying this average by the ratio of valid logs submitted by that State to the total of amateur licensees in the division at the time of the contest. Logs acceptable for the multiplier shall show at least five valid contacts in the contest.

Receiving Contest: Open to all S.W. listeners in Australian stations. Points will be scored in a similar manner to the transmitting contest and logs must show the callsign of the station heard and the serial number sent by it, also the call sign of the station being called. It is not sufficient to log a station calling C.Q.

A station heard may be logged only once for each band.

Awards: Certificates will be awarded to the highest scorer in each call area. Further certificates may be awarded.

Logs should be submitted showing information in the following order: Date and Time, E.A.S.T. band, callsign heard, number sent, station called points claimed.

AMATEURS TO HELP IN OPERATION SMOKE PUFF

AMATEURS in certain sections of the U.S. will be able to assist in yet another scientific venture, that of operation "Smoke Puff." Man will now be attempting to establish an artificial reflecting layer by firing a rocket into the stratosphere and releasing ionised gas.

Last year a rocket emitting nitric oxide gas was fired into the E. layer, some 70 miles up and observations recorded indicated that a reflecting cloud had been formed.

It is hoped that several ionisation-producing rockets will be fired each year and amateur co-operation in observations will commence in July.

The lifetime of the cloud as a reflecting medium will probably be from 10 to 20 minutes, and during that period an artificial patch of short skip produced. Amateurs could possibly establish contacts or make observations during the time, and the circle in which useful data can be collected is approximately 1,300 miles in diameter.

Amateurs participating will be advised of each launching and whether the test was considered satisfactory. Rockets will be fired at various times of the day.

It is anticipated that observations of signals on the 14, 21, 28, 50 and 144 Mc/s bands may provide useful information on the clouds' behaviour.

Frequency Allocations

AN important recommendation recorded by the F.C.C. in the U.S. is to the effect that no changes be made in service frequency allocations of the Atlantic City conference from 10 Kc/s to 10,500 Mc/s. This suggestion would form the basis for action at the 1959 Berne I.T.U. conference. Under this arrangement it means that amateur bands over there would remain as at present unless the recommendation is countered by other U.S. Government, military or industry requirements.

The excellent support the movement receives from the U.S. Government and delegations to I.T.U. conferences must indirectly assist the hobby in other countries, although actual voting is on a national basis.

Queensland Convention

THE Queensland Division of the W.I.A. held their 3rd annual convention over the Queen's Birthday weekend, June 15th, 16th and 17th. The venue, on the "gold coast" of the State, at Palm Beach.

Many amateurs, their wives, children and friends attended, and all helped to make the event a success.

Although rain fell it did not seriously interfere with the many events.

The results of the various competitions were as follows:

7 Mc/s Scramble, 1st, John Pickles, VK4FP. All Band Scramble, 1st, Bill Hall, VK2XT. First Hidden 144 Mc/s Transmitter Search, 1st, Jack Ross, VK4JO.

Second Hidden 144 Mc/s Transmitter Search, 1st, John Pickles, VK4FP.

144 Mc/s Blindfold Hunt, 1st, Jack Ross, VK4JO.

7 Mc/s "Bob Campbell" Memorial Contest, 1st, Bill Hall, VK2XT.

Start working on that mobile and portable gear now and you will really be ready for next year's event at the same location.

The above notes were contributed by John, VK4ZAG.

New N.S.W. Council

THE Council for 1957-1958 of the N.S.W. Division of the W.I.A. sees many new faces, although most of the members have been active in other phases of W.I.A. activity.

The new president of the division is Perc. Healy, VK2APQ, well known as chairman of the V.H.F. and TV section.

Perc has been very active for a number of years, not only on the V.H.F.'s but on H.F. bands, too. Known personally to many amateurs, and with a wealth of Institute experience, he is certain to guide activity along lines most profitable to the movement.

Senior vice-president is Bob Godsall, VK2ARG, also a very active amateur on H.F. and V.H.F. bands. He recently journeyed west to VK2ACU, at Coonamble, with portable 144 Mc equipment and opened another country section. He worked over 180 miles.

Bob used to watch the 144 Mc/s band up in the air, but these days travels on the water and can be heard working portable from his cruiser on Broken Bay. Bob will also manage Public Relations for the division.

The second vice-president is Roy Hart, VK2HO, the oldtimer of the council who first operated in the late twenties.

Recently returned from the Civil Defence School at Macedon, Roy is an authority on C.D. and takes over the position of C.D. Net Co-ordinator.

Another duty is councillor in charge of VK2WI, Rural. He has, through the year, operated on all bands, with special interest in V.H.F. affairs. Roy, more fortunate than most of us, has plenty of spare time.

Max Sobels, VK2OT, needs no introduction. He has operated from a number of Q.T.H.'s in N.S.W. and was active in the Hunter branch of the W.I.A. In recent years he has been explaining the mysteries of television to students at the North Sydney Technical College. Max has lectured to the division on a number of occasions and will take charge of educational and lecture arrangements.

Norm Beard, VK2ALJ, is also a lecturer in TV at the same college and is active on all bands, with some emphasis on the V.H.F.'s and V.H.F. and TV sections' artic ities.

He will assist in secretarial duties on the council.

In charge of secretarial duties is Keith Woodward, XK2ZAU, who has made a name for himself on the V.H.F.s since the advent of the Z. calls.

The seventh member of the council has yet to be elected.

The new council have many ideas they wish to put into practice, with special emphasis on technical lectures at meetings and the reduction of unnecessary business debates. Amateurs will wish them success in a task that will take so much of their time and efforts.

Officers elected at the annual meeting of N.S.W. V.H.F. and TV section of the W.I.A., held on July 5th, were as follows: Chairman, Bob Winch, VK2OA; Vice-chairman, Dave Andrews, VK2AWZ; Secretary, Jim Cuming, VK2ZBD; Councillors, Phil James, VK2ER; John Miller, VK2ANF; and Chas Fryar, VK2NP.

Bargains in Scores, at SURPLUS STORES

512 ELIZABETH ST., MELBOURNE, C.1

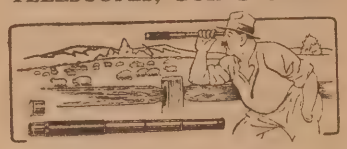
FOUR DOORS FROM VICTORIA STREET

The place for ex-Army and ex-Air Force articles, in excellent condition and astonishingly low prices.

PLEASE MENTION STATE FROM WHICH MAIL ORDER IS SENT, AND KINDLY INCLUDE COST OF PACKING OR FREIGHT

Mail Orders are carefully packed

Shooters! Sightseers!
TELESCOPES, GOING CHEAP



20 magnification, pigskin carrying case, pocket size, very handy, **£5/5/-**. 30 mag., with tripod, **£10/19/6**. 50 mag., prismatic telescopes, on tripod, **£17/17/-**

FLYING BOOTS

Fine thing for Motor Cyclists, Tractor Drivers, etc. Wool-lined.
£5/19/6 a pair.

Universal Flexible Shaft Chuck

¼ inch; 44 in. long. .. **PRICE £4/15/-** Grinding and engraving burrs, pkt. of 6, **2/-**. Polishing brushes, **6d each.** Hobbyists, die-makers, engineers, garagemen, plastic workers, these are useful.

WEATHERPROOF FLYING SUITS

(Brand New. Zippered.) Ideal for Motor Cyclists, Tractor Drivers, Boat Owners, etc. In heavy proofed canvas, with zippers on side, leg and sleeves.

When ordering, please state height and chest measurement. **PRICE 87/6.**

LEATHER FLYING HELMETS

Ex-R.A.F.	**PRICE 50/- EACH**
Intercommunication Tubes	**50/-**
MK7 Goggles	**25/- pair**
Polaroid Goggles	**48/6**
MK8 Goggles	**48/6**

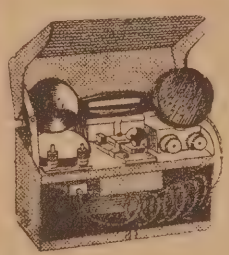
SEALED BEAM SPOTLIGHT

6-volt. The real thing for Cars, Shooting, Boats, etc.
PRICE £4/4/-
ALSO 12-VOLT.
PRICE £4/8/6

Special Offer!

Magnifying glasses, 8 mags., **8/6**; 10 mags., **12/6.** New Headphones for crystal sets, **32/6** pair. Tapped Transformers, 6, 12, 18 and 24 volts, 3 amps, **45/-.** Tweezers, **5/6.** Watchmakers' Eyeglasses, **6/6**; extra strong, 10 mag., **15/-** Set of five Watchmakers' Screwdrivers, **13/9.** 12 volt, 500 watt Generators, **£5.** Metric open-end Spanner Sets (7 spanners), **29/6.** 24 volt, 1500 watt Generators, **£12/10/-.** 200 amp Generators, ideal for welding, **£37/10/-.** Small 50/1 Ball Bearing Stepdown Gear Box, **39/6.**

TELEPHONES: YOU'VE A SPLENDID CHOICE HERE!



DON'v PHONES. A compact unit. Can be used either as a wall or desk phone. It has a range of many miles. **PRICE: £6/10/- EACH.**

DESK TYPE. These are powered by two standard 1½-volt X cells. **£8/10/- EACH. OLNEY PHONES.** Two 1.5 X cells. Range over many miles. Entirely self-contained unit. **PRICE £6/10/- EACH. F. PHONES.** Also self-contained. Two 1.5 X cells. Range, 20 miles. **PRICE (WITH BATTERIES): £8/10/- EACH.** Hand generators, will fit these phones, **12/6 each. AND HERE'S ANOTHER BARGAIN:** Q 22 Twin Wire, 100 yds. on steel drum. Waterproofed for outdoor use. **PRICE, PER REEL, 27/6.**

ENGINEERS' VERNIER GAUGES

Marked in inches and millimeters. **Don't miss this at 14/6**—it's one "out of the box."

COMPLETE BATTERY CHARGER

Fitted with Brand New English Selenium Rectifier

Works off 230v Household Supply.

Charges any battery, 6 volts at 4 amps, £6/15/- complete. Also available, 6 or 12 volt Charger combined. Charges 4 amps, £7/15/-; 6 volt 2 amp Chargers, complete, £5/15/-; 12 volt 3 amp, £6/15/-; 6 and 12 volt, combined 6 amp, £9/15/-.

HERE'S AN ALL-PURPOSE CAP FOR YOU

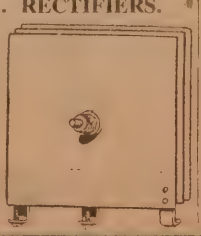
Great wearing for motor bikes or when you want to ski.
GIVE-AWAY PRICE: ONLY 12/6.

Not Secondhand.
BRAND NEW.
ENGLISH G.E.C. RECTIFIERS.

Make yourself a Battery Charger.

12v 2 amp	32/6
6v 5 amp	50/-
12v 3 amp	45/
6v 2 amp	24/-
6v 4 amp	48/-
12v 5 amp	79/6

Transformers to suit these, 2 or 3 amps, 45/-; 4 or 5 amps, 55/-.



LISTEN TO YOUR ENGINE KNOCKS
MECHANICS' STETHOSCOPES
Very cheap at this **PRICE: 35/-.**

AIRCRAFT MOTORS

24 VOLTS, COMPLETE WITH 400 gl. P.H. PUMP.

Ideal for pumping any kind of liquid. Has many uses on any farm. Will work off any 32-volt lighting plant.
PRICE: £12/10/-.

SPECIAL DISPOSALS
METER OFFER
All Brand New. British Made.

0-1 Milliamp Meters, 2½in dial ..	50/-
0-30 amps DC 2in dial	27/6
0-3 amp Meters, AC-DC, 2½in dial ..	45/-
0-50 Milliamps, 2½in dial	27/6
50-0-50 amps ..	50/-
0-50 amps AC-DC	45/-
0-40 amps AC-DC	45/-
0-14 amps AC-DC 4½in	59/6
0-200 amps DC	£4/10/-
20-0-20 amps DC	37/6
0-50 amps AC-DC 3½in	75/-
0-60 amps AC-DC 3½in	75/-
0-80 amps AC-DC 3½in	75/-
0-1 amp DC 2½in	45/-
0-200 amps AC-DC 3½in ..	£4/19/6
0-50 amp AC-DC 2½in	45/-
0-150 milliamps DC 2½in	45/-
0-20 volts DC 2½in	22/6
0-5 milliamps 2½in	45/-
0-30 volts Weston	30/-
0-40 volts AC-DC	45/-

No 50KW for Yanks

THE FCC recently rejected an application for a 5kw power limit for the 144Mc band for the purposes of experimenting with scatter propagation. The Commission stated they appreciated the value of amateur contributions to the science of telecommunications, but believe that the requested increase would not significantly increase the potential for experimentation in the scatter propagation field.

A feature of this winter's 3.5 Mc/s operation has been the absence of the usual VK gang on the Old Man's band. A number of amateurs have remarked on the fact, even the ZLs are not as numerous as usual. Main activity on the band seems to be among VHF fraternity lining up long distance contacts on the 144 Mc/s band. Undoubtedly they will migrate back when the DX attraction of the HF bands is on the wane.

Federal Executive has been notified by the Boy Scouts Association in England that during the Boy Scouts Jubilee Jamboree (August 1 to 12) at Sutton Park, Sutton Coalfield, an Amateur Radio Station under the cal of GB3SP will be in operation.

Special facilities have been granted by the British Postmaster-General including permission to radiate a "News Bulletin." This news service will be radiated on various frequencies "on the hour" between 10.00 hrs. and 22.00 hrs. G.M.T.

As the station will be carrying out the normal operating activities at other times, the scouts are looking forward to making contacts with DX stations. They hope by means of special radiations beamed to suit conditions to reach Australia. All interested are asked to listen for the call GB3SP on bands from 3.5 to 80 megs.

DX record

THE world's DX record on 50 Mc/s received a number of jolts during the first six months of the year. To date, however, no contact has exceeded the 12,000 miles of the JA6FR to LU contact.

Dozens of JAs have worked into South America, all contacts over 10,000 miles, even across to the east of that continent when JA1GP-CX2RE QSO'ed. VKs and ZLs are missing a lot of VHF DX as they are not permitted to operate on 50 Mc/s.

Easily the best propagation conditions recorded on the band were observed. LU7AT reported DX signals for 14 days on end in April.

Prefixes heard included YV, XE, JA, CO, OA, KZ, W, VE, PZ, PJ2.

During this year a number of American stations have contacted three continents on 50 Mc/s. Africa, Asia, South America and the news that 50 Mc/s operation in Europe will be permitted is creating great interest.

During December, CT1 Portugal, CT2 Azores, CT3 Madeira, stations will be allowed the use of the band 50.0 to 52.0 Mc/s and it is anticipated that Swedish stations will soon be operating on the band. Oceania will then be the only continent not operating on the band.

A 50 Mc/s WAC is still a possibility, however, if American nationals on some of the Pacific islands open on the band.

At the end of June, the RSGB conducted a 70 Mc to 50 Mc crossband contest and the Fs will also try to work across the Atlantic on 72 Mc/s.

The next year, with added interest on 50 Mc/s, due to IGY participation, should see even more interesting contacts made.

Third party traffic

AMATEURS in this country have often been embarrassed by overseas amateurs requesting them to relay messages to someone in Australia. Although the habit is not nearly as prevalent as was the case in the period immediately postwar, when so many amateurs returned home, it still occurs.

U.S. amateurs can handle third party messages with amateurs in a number of countries in North and South America and Liberia in Africa, but these messages must be of a personal nature and those that would not be normally carried by commercial communication facilities.

Wholesale international handling of traffic by amateurs was originally banned in the articles of the Madrid (1932) conference.

The exact wording in the 1947 Atlantic City ITU regulations is as follows: "It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties," with an added rider that the provisions can be modified by special message handling treaties between countries listed.

Strictly speaking, we cannot handle any information for or on behalf of third party, even if that person is another amateur.

We have read in the newspapers of how an amateur had arranged the shipment of a rare drug — that fact, possibly, has news value for the hobby. It is, however, strictly illegal and the authorities could take action in such cases.

Signals from VR3

VR3s on Fanning and Christmas Islands have been taking a beating from the usual mass of signals. Some of the big DX men have been heard laying down instructions on how the crowd should behave.

Three of them in quick succession were heard in contact with the VR3s complaining about the general behaviour on the frequency. The interesting point was that all three had contacted the VR3s before.

Surely, while these chaps are still rare, one contact would be enough; it would at least keep the number of stations on the frequency to a minimum.

CHANDLERS

FOR ELECTRONIC A&R EQUIPMENT

AUDIO OUTPUT TRANSFORMERS

Listed below are types normally in stock and suitable for HI-FI or P.A. requirements.

Type No.	Watts	Primary Impedance	Secondary Impedance	Primary will match	Class	Retail Price inc. s./tax 25 pc
HIGH FIDELITY (plus minus 1db 30-15,000 c/s)						
763	15	5000-3000 ohms P.P	15, 12.5, 8, 3.7 and 2 ohms	P.P. 2A3s or 6AS/s	A or AB1	6/17/3
896	15	10,000-8000 ohms. P.P.	15, 12.5, 8, 3.7 and 2 ohms	P.P. 6V6s, 6BW6s, 6M5s, KT66s, etc.	A or AB1	6/17/3
897	15	10,000-8.000 ohms. P.P.	500, 250, 166 125 and 100 ohms	P.P. 6V6s, 6BW6s, 6M5s, KT66s, etc.	A or AB1	6/17/3
SPECIAL HIGH FIDELITY (plus minus ½ db 20-40,000 c/s)						
872	12	10,000 ohms P.P	3.7 or 15 ohms	P.P. 6L6s, 807s, KT66s, etc.	A (triodes)	8/8/7
SPECIAL HIGH FIDELITY (plus minus 1db 10-50,000 c/s)						
2505-8	12	6000 ohms C.T.	(Designed especially for Mullard 5/10 Amplifier)			8/18/5
ULTRA LINEAR plus minus 1db 10-50,000 c/s)						
949	12	8000 ohms	2, 8 12.5 and 15 ohms	6V6, 6BW6, KT61, EL84, etc.	See R & H. Jan., May, Aug. 1955.	9/7/11
MEDIUM FIDELITY (plus minus 2db 50-12,000 c/s)						
809	15	500 ohms	15, 12.5, 8 3.7 and 2 ohms	Line to voice coil		4/9/9
914	15	5000-3000 ohms. P.P.	500, 250, 166, 125 and 100 ohms	P.P. 2A3s, 6A3s, 6AS7s, etc.	A or AB1	6/4/-
915	15	5000-3000 ohms P.P.	15, 12.5, 8 3.7 and 2 ohms	P.P. 2A3s, 6A3s, 6AS7s, etc.	A or AB1	6/4/-
917	15	10,000-8000 ohms P.P.	500, 250, 166, 125 and 100 ohms	P.P. 6V6s, 6BW6s, 6M5s, KT66s, etc.	A or AB1	6/4/-
918	15	10,000-8000 ohms P.P.	15, 12.5, 8 3.7 and 2 ohms	P.P. 6V6s, 6BW6s, 6M5s, KT66s, etc.	A or AB1	6/4/-
922	25	8000 ohms	500, 250, 166, 125 and 100 ohms	P.P. 6L6s, 807s, KT66s, etc.	AB1	7/7/9
891	35	6600 P.P. ohms	500, 250, 166 125, 100 and 83 ohms	P.P. 6L6s, 807s, KT66s, etc.	AB1	8/3/6
928	5	7000-5000 ohms S.E.	12.5, 8, 3.7 and 2 ohms	6V6s, 6BW6s, KT61s, 6M5s, etc.		3/7/-

Queensland readers only invited to write for comprehensive data sheet.

CHANDLERS

PTY. LTD.

CNR. ALBERT & CHARLOTTE STREETS, BRISBANE
BRANCHES THROUGHOUT QUEENSLAND

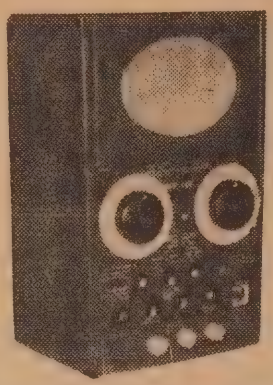
EXPERT TECHNICAL ADVICE AND ASSISTANCE AT ALL HOURS

Phone: Day LA3845. Night, Weekends, and Holidays, XW5956

A.C.E. Amplification Communication Electronics

DULWICH HILL, UNDERCLIFFE, EARLWOOD.

EVENINGS and WEEKENDS: "KALUA"



AR8 COMMUNICATIONS RECEIVERS

12 valve. Converted to 240v. A.C.
Thoroughly Tested Re-aligned
Latest Ovaltone Permag Speaker

£34/17/6

Type T3 press to talk CARBON MICROPHONES

NEW

12/6 ea.

NEW 24V MOTORS

Series wound Hi-Speed miniature 12,000 RPM £2/10/-
Shunt wound with gear box 2 speed 5 and 25 RPM £2/10/-

12 VOLT GENERATORS

New C.A.V. 80 amp. Generators. Ideal for lighting or fast charges.

£10/10/-

Throat Mikes New 3/6
12V. 420 watt Prefocus Globes 7/6

NEW C.R.O. TUBES

All tested on TV picture

3BP1 with shield and socket £3/17/6
VCR 97 .. .. £2/17/6
ACR2X & Shield £3/0/0
CV 112 White 5" £3/10/0
CV 254 9in. Blue Screen, Magnetic Deflection & Focus

£4/10/-

Every tube capable of perfect picture
Fast persistence and simple construction using standard components

NEW 2½" MOVING COIL R. F. METERS

350. MA and T. Amp.
Can be shunted for other ranges

7/6 ea.

POSTAGE 1/6

Used units as above. Good order

4/6 ea.

POSTAGE 1/6

AR8-AT5—COMPLETE STATION

AIR TESTED

Transmitter-Receiver, Aerial Coupler
Cables, Plugs, Phones, Mike.
1 Crystal to desired Frequency
24V Power Supply & Circuits of 2 units
GUARANTEED IN PERFECT ORDER

£62/10/- Other voltages available

NEW B.S.R. FP10 GRAMO MOTORS

240 or 110
FOR THAT TAPE RECORDER

£1/19/6 POSTAGE 2/6

NEW VALVES

217C	10/-	6E5	12/6
12C8	12/6	12K8	12/6
6J8	17/6	VT502	12/6
VT501	12/6	7A6	7/6
EBC33	12/6	AV11	3/9
1H6	7/6	832A	£3/0/0
6L6	20/-	6K7	7/6
1C6	12/6	12SJ7	12/6
1G4	12/6	12SK7	12/6
1D4	12/6	12SL7	12/6
1J6	12/6	39/44	10/0
1K4	12/6	46	12/6
1K6	12/6	47	12/6
1LH4 ..	12/6	78	12/6
1P5	5/-	828	£2/10/0
6A6	12/6	843	£1/10/0
3A4	15/-	957	6/6
3B7	10/-	1625	£1/0/0
3D6	10/-	1629	10/0
6AG5 ..	9/6	4307A	10/0
6AM5	15/6	1619	£1/0/0
6AM6	17/6	2050	£1/0/0
6H6	7/6	9001	8/6
6J6	15/-	9003	12/6
6J7G	9/6	9004	8/6
6N7	10/-	RK75	10/0
6SK7	12/6	VR75/30	15/-
6SL7	12/6	RK48A	£3/0/0
10	15/-	954	7/6
12A6	12/6	VR105/30	15/-
2A3	£1/0/0	1C7	4/6
KTW62/6U7 ..	7/6	1T4	12/6
1M5	7/6	1A5	7/6
1D5	7/6	7193	3/6
CV6	3/6	829B	£3/0/0
6F6	12/6	6G8	15/-
VR65A/SP41 ..	2/6	6B8	12/6
KT66	27/6	807	£1/0/0
806	£3/10/0	EL3NG	12/6
6V6	12/6	83	10/0
1K7	7/6	EMI	12/6
6X5	10/-	866A	15/-
1Q5	6/6	6AC7	3/6
811	1£	EF50	3/6
X61M	17/6	100TH	£2/5/0

INVERTERS

6V. 12V. 24V. 32V. DC to 240 AC
60 Watt to operate Radio, Fluorescent Lights, Shavers, etc.

£8/17/6

NEW TRANSFORMERS

FERGUSON.

VIBRATOR TRANSFORMERS

150 x 150 40MA. 6V. £1 4 6
300 x 300 100 6V. £1 17 6
325 x 325 125 12V. £3 12 6

INVERTER TRANSFORMERS

6V. 240V. 40 watt £3 7 6
12V. 240V. 60 watt £3 7 6
32V. 240V. 60 watt £3 7 6

C.R.O. TRANSFORMERS

350 x 350 extended to 1000V. 6.3V. 6.3V. 215V. 4V. **£4/5/-**

POSTAGE N.S.W. 5/- INTERSTATE 7/6

New A.R.B. Receivers

8 Valve
4 Band 195 KC. to 9.025 Megs.
24V. D.C. Operation £22 10 0
Converted for 240V. A.C. .. £33 15 0

RELAYS

6v. 3Ple Miniature 15/-
1700 SPDT 7/6
1300 SPDT 7/6
500 x 500 SPDT 7/6
12 volts DPDT 5 amp £1/-/-
24 volts DPDT 12/6
8-16 volt DPDT 12/6
11 volt AC £1/-/-
Hi-speed Polarised relay £2/10/-
400 ohm 12/6
1300 ohm DPDT 15/-

½in Square Section DURAL TUBING UP TO 12ft lengths 1/- per ft.
Hi-lo Phono Transformers .. 4/6
Spirit Level Bubbles, mounted 4/6
Canadian Signal Lamps 12/6
Hi-voltage Lead-Thru Insulators, ... 1/6 each, 15/- doz.
Hydrometers, Battery Testers 5/9
Torches 2-cell Focusing 6/9
Multi-Strand 4 core Cable, Yard, 1/-; 100 yards £2/17/6
Tx Var. Condensers, 300 pf £1/5/-
100 pf £1/1/-
60 pf with Vernier £1/1/-
30 pf 10/-

RADIO

PHONE LA 3845

136 VICTORIA RD. MARRICKVILLE. SYDNEY, N.S.W

TRAM AT DOOR. STOP 42

COLLAROY ST., COLLAROY—XW5956

A.W.A. .3B TRANSMITTERS

12 Volt operation
3 to 9 megs. 10 watt output
Airtested complete with 1 Crystal
£29/10/-

TELEPHONES

Standard P.M.G. Type
Pedestal Magneto Phones tested in perfect order.
£6/10/-

RECORDING TAPE

E.M.I. & Scotch. Hi. Coercivity. Excellent Condition. Ex ABC.

1200 ft. Spools	£1	8	6
600 ft. Spools		18	6
3250 ft. Platters	£2	10	0

NEW ALPHA SWITCHES

Rotary D.F.D.T.	3/9
Rotary D.P.S.T.	3/3

POSTAGE 6d

NEW No. 22

2 to 8 megs as above. Converted to Crystal Control. Power increased to 20 watts. Includes Plugs and Cables Mike, Speaker, Circuit, 2 Crystals to wanted frequency conforms to PMG requirements for small ships and other services. **£49/17/6**

WANTED

Communication Receivers
Test equipment, P.A. gear.
Large or small surplus stock.
Best prices. Call, write or phone any time.

OIL-FILLED CONDENSERS

1UF 600V	6/6	5UF 2.5V	6/6
4UF 750V	12/6	5UF 400V	6/6

10MFS 500 7.5UF 330V AC 10/-

NEW P.A. AMPLIFIERS

10 WATT OUTPUT

12V. D.C. powered. 5 valve input for crystal mike & P.U. Fader Controls & Tone Control Standard Octal valves. **£14/17/6**

Telephone Equipment

Hand sets	£1/9/6
Mike inserts	3/6
Head and breast sets	17/6
Hand sets with pressel-switch	£1/15/-
Hand generators & bell	9/6
Adjustable buzzers	7/6

Miniature telephone units to suit Handsets or H & B, 10/-

NEW SMITH AIRCRAFT CLOCKS

8-day movement. Cost Govt. £28
2¼" £4/15/0
2¾" with sweep hand £5/15/0

New Coils and Intermediates Standard or Miniature to suit all valves

Coils B/C 455 KC	9/6
Coils S/W 455 KC	9/6
Inters	11/6
Loop aerial coils	9/6
Slug tuned H.F. coils suit 44 meg.	4/6

GENEMOTORS

Input	Output			
24V	250V 100MA		£1	0 0
24V	550V 375MA		£2	0 0
24V	250V 60MA		£1	5 0
12V	500V 350MA		£8	10 0
12V	1200V 200MA		£6	10 0
6V	500V 150MA		£6	10 0
24V	250V 100MA	New	£2	0 0
12V	300V 250MA		£4	10 0
12V	235V 50MA		£2	15 0
12V	350V 50MA		£2	15 0

SPECIALS for August Only

WE ARE OVERSTOCKED, WE NEED THE SPACE. PRICES APPLY ONLY FOR 1 MONTH

100 ASSORTED RESISTERS

New well-known makes 50 values.
8/6 Postage 2/6

New Electric 24v to 32v Hydraulic Pumps

Heavy duty motor develops 1 hp cont 2 hp intermittent. Ideal motor for operating power tools off 32V-DC.
£1/15/-

ENGLISH I.F.F. UNITS

New condition V.H.F. TX. RX. 10 valves 24V genemotor and a host of parts. No circuits.
£2/17/6

Steanes P.A. Horn Speakers

5ft. Horns. O.P.T.X. 500 & 1000 fitted

New Condition	£19/10/-
With Reflex Horns	£22/10/-

TRANSCEIVERS

No. 11 Less valves & meter £3/-/-
No. 11 Including valves & meter £4/10/-
No. 19 Less valves & meter £3/-/-
No. 19 Including 15 octal valves £5/15/-
and 500 micro amp. meter
N.S. All these units are in excellent condition For original use parts or conversion

New Creed Hi-Speed Relays

Laboratory Standard Instruments. Will operate to 3000 Pulse per minute
£1/7/6
BASES 10/- extra

522 TRANSCEIVERS

17 valves 100 to 156 Megs Complete with valves.
£14/10/-

CONDENSERS

NEW 100 ASSORTED
Mica. Paper Electrolytics 20 values.
£1/8/6 Postage 2/6

NEW COPPER OXIDE RECTIFIERS

24V. 100MA. BRIDGE, ideal for trickle Chargers. Relay operation etc.
2/9 ea. **25/- doz.**

NEW SENSITIVE RELAYS

Operate on 3 volts.
Fully adjustable idea' for models, Alarms etc.
5/- ea. **£2/15/- doz.**

2½" Moving Coil Meters

Flush Panel Mount 15 MA & 30 MA
12/6 ea.

24 to 32v INPUT GENEMOTORS

Fully filtered. 250V 60 MA Output & 6V 2.5 Amp. Secondary.
£1/17/6
12V Model as above
£2/7/6

A.C.E. RADIO

Amplification Communication Electronics

PHONE LA 3845

136 VICTORIA RD. MARRICKVILLE, SYDNEY, N.S.W

AND 636 KING STREET, NEWTOWN

EVENINGS and WEEKENDS: "KALUA", COLLAROY ST., COLLAROY—XW5956

DULWICH HILL, UNDERCLIFFE, EARLWOOD, TRAM AT DOOR, STOP No. 42

8 VALVE RADIOGRAM HI-FI CHASSIS

Dual wave, bass & treble boost tuned R F stage 12" speaker.

£28/17/6

5 VALVE RADIOGRAM CHASSIS

DUAL WAVE 12in SPEAKER

£18/15/-

5 valve also available as home constructors Kitset **COMPLETE WITH CIRCUIT £14/15/-**

7 VALVE DX RECEIVER

3 band, 2 to 6 to 18 megs 160 to 16 metres and broadcast. Exceptional selectivity sensitivity 2 microvolts. **NEW AUSTRALIANS,** listen to European short wave stations.

£29/17/6

PUBLIC ADDRESS RANGE 240-AC

6 valve 10 watt **£14/17/6**
6 valve 25 watt **£25/7/6**
6 valve 40 watt **£32/7/6**

BATTERY ONLY OPERATION

6 valve 6 volt 10 watt **£18/15/-**
7 valve 12 volt 10 watt **£19/15**
7 valve 12V 25 watt **£24/17/6**

BATTERY AND A.C. OPERATION

6 valve 10 watt 6V. **£20/15/-**
7 valve 12 watt 12V. **£21/15/-**
7 valve 25 watt 12V. **£29/7/6**

HI-FI RANGE

MULLARD 5/10

£34/15/-

Complete with Jensen twin cone speaker, Ferguson O.P. transformer, 301 & U.L. taps.

MULLARD 5/20 AS ABOVE

£42/15/-

Tuner & separate control box with mike, pre-amplifier.

£12 extra

THE FINEST SET AT ANY PRICE

CHECK THESE EXTRA FACILITIES

Built-in Preamplifier to suit crystal microphone tape deck, electronic guitar, sound on film, TV, etc.

Hear it demonstrated on these units.

DEMONSTRATIONS

EVERY SUNDAY 2 to 5 p.m.

OR EVENINGS. BY PHONE APPOINTMENT

AT COLLAROY

PHONE XW5956

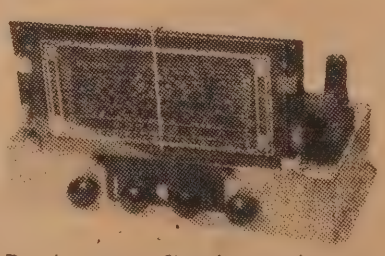
CABINETS AND ALL ACCESSORIES TO SUIT

THE OUTSTANDING 10-VALVE HI-FI

RADIOGRAM CHASSIS

Incorporating Mullard 5/10 bass boost amplifier, treble boost dual wave tuned R.F. stage. Built-in pre-amplifier for microphone or tape recorder including Jensen twin speaker.

£44/15/-



Dual wave, 6 valve radiogram chassis includes bass & treble boost, 12" Jensen or Magnavox speaker.

£23/15/-

TV EQUIPMENT

Formers in cans with special V.H.F. tuning slugs and winding data for video and sound I.F.s and traps. . . . 6/6ea.
E.H.T. Transformers for 3000v £1/15/-ea.
5000v Insulation Fil Transformers £2/-/-ea.
Video and sound I.F.s ratio detectors and traps to A.W.A. circuit specifications Prealigned . . . . . 19/6ea.
Wired and tested video and sound I.F. strip with traps and ratio detector including valves and circuit. Including valves £19/-/-
Wired and tested. Strip as above but using new ex-disposal valves and circuit etc. £16/-/-
N.B. All equipment complies with P.M.G. specifications.
Turrets, line transformers, yokes, deflection coils and standard 17" tubes available. Also first class technical and alignment service.
Coils and I.F.s. etc. including chassis and sockets and circuit for Steans video and sound strip. £6/10/-

R.T. & H. TV KIT

NOW AVAILABLE

SEE IT IN OPERATION

T V TEST EQUIPMENT

Crystal marker generator 5½ megs. & every ½ meg. to 50 megs.

£22/10/-

R.T. & H. WIDE RANGE C.R.O.

Wired & Tested.

£52/10/-

Also simplified version. 6in C.R.O. P.P. Deflection.

£44/15/-

4 SPEED PLAYERS

£11/17/6

4 SPEED CHANGERS

£16/17/6

AIR PRESSURE AND THE WEATHER

(Continued from page 19)

We depend for rain on the Low pressures in the South forcing the Antarctic cool air up to the continent where it condenses.

In summer time the centres of the Highs usually pass to the south somewhere across the Great Australian Bight. It is then that we depend on northern Lows like the monsoons to bring us the rain we need. Sometimes these Lows are very great in extent extending down from Asia right into N.S.W. and bringing extensive rains. If you look at the maps herewith you will notice that on the southern side of a High the wind is blowing from the west. On the eastern side it is southerly, on the northern side it is easterly and on the western edge it is northerly. On the "corners" it is on the "half-way" marks so to speak.

In a Low pressure system everything is reversed because the wind blows in a clockwise direction. Thus on the southern side the wind is from the east and so on right round the circle.

HIGH PRESSURE RIDGE

It so happens that, because of Australia's geographical position we lie in the path of part of the sub tropical high pressure ridge of the Southern Hemisphere. The pressure systems move from west to east in a continuous procession so that any area usually receives one high pressure system every week. The system moves from west to east at the rate of about 17 miles per hour.

Look at the map for the 2nd May given here. There is a High at the bottom of Western Australia. By the 7th it has moved across over N.S.W. On the 10th another High is moving into Western Australia and a Low or Cyclone is pushing a "Tongue" up between the two highs. There is always a low pressure between two highs.

The black saw toothed line through this Low indicates that a "front" of cold air is on the way to the east. This is a COLD FRONT.

We could have received rain over central Australia and South Australia from this LOW if it wasn't for the fact that the Highs on either side were too strong and pushed the cold moist air back into the Antarctic, so that by the 21st May the Low is pushed right out of the way and the High is spread out all over the continent.

PERSISTENT HIGH

By the 23rd little change is noticed. The High which should have moved to the east still dominates the continent with two weak Lows one on either side.

On the 24th these two Lows have been also pushed away and the High still dominates. The 28th shows the High having moved east with another Low tongue between the eastern High and another coming in from the west.

The map for the 29th shows the eastern High still in the same position and the Low tongue considerably weakened. This has persisted right through to the 6th of June where we reach a stage where this High has been hanging around the one place for some three weeks.

This is one of those occasions where the pressure systems do not behave normally and of course bring abnormal weather.

The last map for the 10th of June shows the High still over N.S.W. but a fairly strong Low tongue with two pronounced Cold Fronts is moving from the west. This could bring good rains and indeed to-day's forecast is more hopeful. Whether the Low is strong enough to push the eastern High away only to-morrow can tell. I'll certainly watch that forecast but don't blame me if nothing happens. Just tell me how good I am if rain comes. Publicise my success, that's the way to do it.

The reason why this High has been hanging around New South Wales for so long like an income-tax collector after an unpaid bill, has been explained as follows.

COOLER AIR

All the air surrounding the continent particularly to the south is much cooler than the air over the land. This cool air has banked up all round the centres of High pressure, forcing its way upwards through the Lows and descending again in the Highs thus creating a cycle of a continually built up pressure in the Highs which is always more powerful than the Lows.

This is the explanation given to me by an authority. Whether it makes sense to the reader is another matter but it sounds feasible if you read it two or three times.

The continuous procession of High pressures across the Australian continent, makes it the most arid of all the continents. Even its shape is unfavourable because, having its greatest length from east to west, the greater portion is exposed to the influence of the High pressure.

We have no extremely high mountain ranges, no large rivers or lakes, no great indentations of the shore line except the Gulf of Carpentaria. Thus most of the land surface except the coastline is more or less isolated from large bodies of water which, by evaporation, influence rainfall.

It is therefore follows that only the narrow coastal belt has any sort of a decent rainfall while the interior is dry and arid.

Sometimes on the coast a High pressure system in summer will bring showery weather there because the south easterly wind, which blows at the "top" end of the High brings moist air in from the sea. It flows across the land to the Great Dividing Range where it is forced to rise, cools and condenses into rain between the coast and the mountains.

There is very little rain on the other side of the range from such a High.

SPECIAL . . .

Lucas Twin Magnetos

. . . (New condition)

Special Price £3/10/-

LIMITED STOCKS ONLY

Bargain . . . Mirrors

Interior Type 4/- each

Motorcycle Chrome Edge

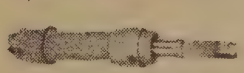
Limited Stocks 6/- each

P.I. GENERATORS

24 volt, 200 amp. Ideal Welder

NEW £30 Reconditioned £27/10/-

ENQUIRIES ON ANY AIRCRAFT SURPLUS EQUIPMENT APPRECIATED



HYDRAULIC RAMS, PUMPS, VALVES TO SUIT MOST PURPOSES

Write for details and technical advice

WILMOR TRADING Co.

360 ELIZABETH STREET

MA3714 SYDNEY MA7510

At last! A SUPERLATIVE Pick-up which you can afford!

The

ORTOFON

Pick-up Type A with Sapphire Stylus and Arm S212

The performance of the ORTOFON Pick-up Type A is almost identical to that of the ORTOFON Type C advertised by us last month. It is fitted with a Sapphire Stylus and is used with Arm S212 and Transformer. Of identical design but slightly more robust construction, the Type A Head is most suitable for general use.

With an output comparable to that of the best Crystal Pick-ups (100 mVs), and the excellence of its moving coil design, this Pick-up when used with most good amplifiers gives a standard of performance hitherto unobtainable at such moderate cost.

Available from progressive radio retailers throughout the Commonwealth.

Australian National Distributors:

Simon Gray Pty. Ltd. (RADIO DIVISION)

28 ELIZABETH STREET, MELBOURNE C.1. Telephones MF 8211, MF 8166

Do You Laugh Your Greatest Powers Away?

THOSE STRANGE INNER URGES

You have heard the phrase, "Laugh, clown, laugh." Well, that fits me perfectly. I'd fret, worry and try to reason my way out of difficulties—all to no avail; then I'd have a hunch, a something within that would tell me to do a certain thing. I'd laugh it off with a shrug. I knew too much, I thought, to heed these impressions. Well, it's different now—I've learned to use this inner power and I no longer make the mistakes I did because I do the right thing at the right time.

This FREE BOOK Will Prove What Your Mind Can Do!

Here is how I got started right. I had heard about hypnosis revealing past lives. I began to think there must be some inner intelligence with which we were born. In fact, I often heard it said there was; but how could I use it, how could I make it work for me daily? That was my problem. I wanted to learn to direct this inner voice, master it if I could. Finally, I wrote to the Rosicrucians, a world-wide fraternity of progressive men and women, who offered to send me, without obligation, a free book entitled "The Mastery of Life."

That book opened a new world to me. I advise *you* to write to-day and ask for your copy. *It will prove to you* what your mind can demonstrate. Don't go through life laughing your mental powers away. Use the coupon below or write: Scribe D.N.X.

USE THIS GIFT COUPON

SCRIBE D.N.X.
The Rosicrucians (AMORC)
Box 3988, G.P.O., Sydney, Australia

Please send free copy of *The Mastery of Life*, which I shall read as directed.

Name.....

Address.....

City.....State.....

The **ROSICRUCIANS** (AMORC), Box 3988, G.P.O., Sydney, Australia

LET'S BUY AN ARGUMENT

(Continued from Page 83)

Room light shining on to the tube face is reduced in quantity as it passes through the filter glass. It is further reduced when reflected back so that, without a picture, the tube face appears initially much darker than without the filter glass.

Add to this the ocular and lighting effects already mentioned and it becomes possible to watch a television program quite easily while other members of the household read or knit in the same room—if they can concentrate on such other tasks.

This is where M.G. enters his protest. He suggests that it is wrong to watch television under these conditions, because it produces eyestrain and also nervous strain by reason of the efforts necessary to concentrate on the picture, in competition with other visible distractions.

Both ways, I think, he is overstating the case.

He speaks of ambient light "shining into the eyes."

LIGHT IN THE EYES

He may have used the phrase quite innocently but it immediately suggests a situation where the source of ambient light is in the field of vision and therefore, in truth, "shining into the eyes."

That, I heartily agree, would be no more desirable than trying to read with a lamp on the table directly in line with the book. Or yet, reading flat on one's back in bed, with only a ceiling light switched on.

When one speaks about viewing television in moderate ambient light, it presupposes that the source of light is outside the field of view—either a lamp placed in another part of the room, or high overhead, or else left on in an adjacent room. It is assumed also that there are no highly reflective surfaces adjacent to the set, which might assume the character of a light source.

To speak of light "shining into the eyes" under such conditions is an exaggeration in terminology, to say the very least.

DISTRACTIONS

Then M.G. seems to be very concerned about the distracting influence of objects or people in the room, revealed by such subdued lighting.

If one's job were to concentrate on the television image, to the exclusion of all else, then I would agree. If it was a radar screen and the viewer was watching for some elusive "blip," then near-darkness might be a prerequisite for concentration.

But television isn't a job, it's an entertainment. If the entertainment value is nigh, concentration will not be a problem. There won't be any nervous strain from trying not to look at something else!

If the interest in the picture is low or intermittent, then it is a good thing to let the eyes stray away from it to other people in the room. Unless I'm much mistaken, the very act of moving the eyes from a fixed position will provide an excellent insurance against strain.

There are plenty of T.V. shows which lend themselves to a certain amount of back-chat between the audience — for which I personally am duly thankful. While I like to be quiet in the right places, and other people to be likewise, I have no desire to spend all my evenings henceforth in a darkened room, gazing in stony silence at a glowing glass.

They're my ideas, anyway.

If they need support, may I quote from a set of rules for comfortable television viewing, which have just been issued by the British Institute of Ophthalmology. They were brought to notice by Mr. F. D. Wallace, sales manager for E.M.I. Television in Australia.

They are quoted in the panel under the appropriate heading. Maybe you agree, maybe you don't. I wonder what M.G. will say?

AWA RONETTE

MICROPHONES & ACCESSORIES

Type R474

£28'9'10

Studio type, cell, omnidirectional. Technical pamphlets will be mailed on request.

NICHOLSONS LTD.

BARRACK ST., PERTH.
(and leading wholesalers)

A CAREER IN TV
is built on a sound knowledge of RADIO

The need is urgent for men with a full knowledge of Radio/TV and Electronics. NOW is the time to "get in on the ground floor" and prepare for interesting lucrative positions in this big field. I.C.S. Home Study Courses give the training that measures up fully to the industry's requirements. For FREE Study Guide, advice and information fill in and send the coupon NOW!

INTERNATIONAL CORRESPONDENCE SCHOOLS
140 Elizabeth Street, Sydney.

Courses include

Radio/TV Engineering — Television Technician
TV Receiver Servicing — Radio, TV Servicing
Radio Servicing — Electronics
ALL RADIO EXAMS
Institution of Radio Engineers; Commercial Operator's, Broadcast Station Operator's and Amateur Operator's Certificates, etc.

Name .....
Address .....
..... R H

I.C.S. - I.C.S. - I.C.S. - I.C.S.

JUNIOR SALESMAN
SENIOR SALESMAN

WANTED FOR High Fidelity showroom. Technical knowledge of Hi-Fi equipment essential. Good conditions and salary. Apply Audio Engineers Pty. Ltd., 422 Kent Street, Sydney.

Get your copy
Woman's Day
WOMAN
everyMONDAY

VACUUM MOUNTED CRYSTALS

for general communication frequencies in the range 3 — 14M.C. — Higher frequencies can be supplied.

IMMEDIATE DELIVERY OF THE FOLLOWING FISHING CRAFT FREQUENCIES
(IN F.T. 243 HOLDERS)
6280, 4095, 4535, 2760, 2524

AMATEUR TYPE CRYSTALS 3.5 AND 7 MC BAND
(IN F.T. 243 HOLDERS)

£3/-/- each. Plus 12½% Sales Tax. REGRINDS £1/10/-

Crystals for Taxi and Bush Fire Sets also Available.

We would be happy to advise and quote you as to the most suitable crystal for your particular application either in the pressure or vacuum type holder.

New Zealand Representatives:—Messrs. Carrel & Carrel, Box 2102, Auck.

BRIGHT STAR RADIO

46 Eastgate St., Oakleigh, S.E. 12; Vic. UM3387.

SPECIAL PURCHASES

NEW MICRO-AMMETERS

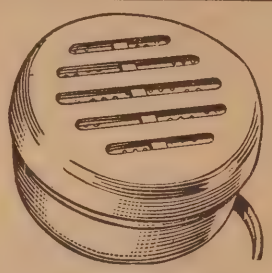
NEW PATON MICRO-AMMETERS, 0-500, M.A 1¾in diameter Flush mounting

25/-

Post and Packing 2/6.

METER RECTIFIERS

WESTINGHOUSE 1M.A METER RECTIFIER.
FULL WAVE. NEW 15/-.



PILLO-FONE

EXTENSION-UNIT

IT'S A REAL MINIATURE WITH ROLA UNIT.

Install it anywhere, in the sick-room, work shop, garage or any room in the house. Just connect across voice coil of the existing speaker. The "PILLO-FONE" IS THE MOST CONVENIENT LITTLE UNIT YET DEVISED

3½in Diameter by 1¾in deep POST FREE

22/6

"Mercury" American Made.) These relay counters register from 0 to 99,999 can be supplied with 250-ohm coil 24v D.C. operation

25/-

Plus Postage

NEW AMERICAN BOX KITES

These kites are constructed of Silk with Metal Frame.

SIZE 15in square x 3ft long. Originally used for Aerials for Lifeboat Transmitters.

30/- Post 2/-

NEW ROTARY-CONVERTERS

-4 to 32 Volt D.C. Input. Output. 240 Volt 50 cycles at 150 Watts Suitable for Tape Recorders Radiograms, Amplifiers, etc.

£16/15/- F.O.R.

No. 19 TRANSCEIVERS

These units cover a frequency of 2 to 8 mc and contain 15-6.3v valve, including 1-807 2-6V6S 6-6K7G 2-6K8G, 6B8S ETC, 0-1MA Meter 4-GANG cond H.F Unit ETC.

£6/15/- F.O.R.

12v Gene Motor for above. **£3/5/-** F.O.R.

VALVE SPECIALS

20/- will purchase anyone of the following valve Specials

2	EL3NG	3	6K8G
3	1P5	5	6SH7
3	1Q5	6	6AC7
5	1C7	4	6J7G
10	1KS	4	KTW62/6U7
5	954	4	12A6
5	EF50	2	6X5GT
4	6C8G	8	EA50
3	6SA7	5	6K7G

Post and Packing 1/6 extra

ALL VALVES ARE NEW

NEW 6H6 OR 6H6GT VALVES

Individually Cartoned

20/- per doz.

POST 2/6

TRANSMITTING VALVES

829B	£3	5	0
100TH	£2	10	0
866		15	0
811	£1	0	0

— FREE —

New Paton 3in 0-1.R.F. Meter supplied with new Scale and Shunt to convert to either 10 or 100ma. METER.

Supplied free with all orders of £4 or over. Add 1/6 postage.

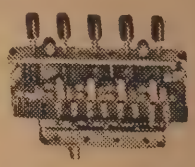
No. 122 TRANSCEIVERS

In new condition, complete with valves, vibrator power supply, leads, and dynamic microphone and headphones. These units are easily converted to comply with P.M.G. requirements for small boats, etc. Freq. 2 to 8 meg.

£19/15/-

Packing 20/- extra

NEW PUSH-BUTTON SWITCHES 20/-



Five pole push-button switches. New control box fitted with above switch also 5 bezels with globes and multi contact key switch

Post: N.S.W 2/-
Int 3/-

NEW B.S.R. MOTORS

These English B.S.R. Motors as used on most tape decks also have many other uses. Size of motor, 3in x 2½in x 2¼in with ¼ 16in shaft for 240 or 110 volt AC operation

NEW 39/6
Used but in good condition 27/6

Post: N.S.W., 3/-; Interstate 4/6

NEW GRAMO MOTORS

New H.M.V. spring gramo motors less turntable. Adaptable for many uses 19/6

Post: N.S.W., 4/6. Interstate, 7/6

CERAMIC TRIMMER CONDENSERS

Small Plate 0-70 PF Single Hole Mounting, Long-spindle	7/6
Small 7-plate, 0-20 PF	3/6
Small Tubular, 0-20 PF	2/-

SELSYN-MOTORS

American selsyn-motors 50 volt transmitter or slave.

£1/17/6. Plus 4/6 Post.

HYDRAULIC PUMPS

New motorised hydraulic pumps complete with heavy duty 24 volt motor

35/- F.O.R.

12V GENEMOTOR

Heavy duty 12v Genemotor—ideal for public address systems etc. Two separate outputs—270v at 110mA and 550 at 55mA **£4/-/-** F.O.R

Please address all correspondence to 479 Parramatta Road, Leichhardt, N.S.W

METROPOLITAN RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE LM7398
479 PARRAMATTA ROAD LEICHHARDT, N.S.W. PHONE LM3610
640 KING STREET, ST. PETERS, N.S.W. PHONE LA6087

NEW VALVES AT REDUCED PRICES

1A7G 7/6	6B8 (metal) 10/6	6J6 .. .. 15/	6.1W62/6U7 .. .. 9/9
1Q5G 7/-	6C8G 7/6	6SA7GT 12/6	VR65A 2/6
1P5G 7/	6E5 .. .. 8/6	6SQ7GT 9/6	CV6 .. .. 3/6
1C7G 5/-	6H6 .. .. 3/-	6SH7GT 5/6	7193 .. .. 3/6
1D5G 7/6	6H6GT 3/-	6L6 (metal) 20/	954 .. .. 4/5
1K5G 2/6	6J7G 7/6	6A3 .. .. 15/	955 .. .. 10/-
1K7G 7/6	6K7G 6/-	7C7 .. .. 3/6	12A6 .. .. 10/-
1M5G 7/6	6K7GT 7/9	7A6 .. .. 3/6	EF50 .. .. 3/6
1L5G 9/6	6U7G 6/6	78 .. .. 7/6	110TH £2/9/-
6AC7 .. .. 3/6	6V6GT 12/6	71A 7/6	829B £3/5/-
6B6G 9/6	6X5GT 10/-	EL32 .. .. 10/6	811 .. .. £1/-/-
6B8G 9/6	6K8G 10/6	EL33 .. .. 12/6	866/866A 15/-
		EBC33 .. .. 9/6	828 .. .. £1/9/-
			806 .. .. 4/9/-

PLEASE ADD POSTAGE ON ALL VALVES.

ALL GOODS ADVERTISED ON THIS PAGE ARE NEW

NEW POWER TRANSFORMERS

60mA prim.; 240v with 230v tapping. Sec. 285 x 285 with 6.3v filament winding.

24/6

Plus Postage: N.S.W., 3/6: INT. 5/3.

MICA CONDENSERS

Standard Mica Condensers, small current types. .00003 to .005 including most wanted values.

Per 100 20/-. .. .. Postage 1/6

New Midget Power Trans.

40mA Prim. 250v. Sec. 225 x 225 with 6.3v Fil. Winding. Upright or Flat Mounting. Size 2in x 2¼in.

22/6

2/6 Postage, N.S.W.; Interstate 4/6.

30mA, .240v. Prim. 150 x 150v. Sec. with 6.3v. Fil. Winding.

20/-

Postage N.S.W., 2/6; Interstate, 3/6.

Electrolytic Condensers

12 mfd 525v	4/6
16 x 16 mfd 350v	4/6
24 mfd 350v	3/3
20 mfd 200v	2/6
250 mfd 12v	1/6
30 mfd 350v	3/6
300 mfd 12v	1/6
8 mfd 350v	2/6
10mfd 40v	1/6
8 mfd 525v (miniature)	4/6
8 mfd 525v	3/6

(Plus Postage)

12 inch P.M. Speakers

12in per-mag speaker by well-known manufacturer. 10T. CT, or 5000 Transformer £2/17/6

Postage, N.S.W., 6/6; INT., 9/6

NEW 5in. PER-MAG SPEAKERS

5C Standard 23/-
5F Heavy Duty 25/-
Supplied with 5T, 7T, or 10T. Transformer.

Postage Extra: N.S.W., 2/3; INT., 4/6

6in x 9in Oval Dynamic Speakers with 5T or 7T Transformer.

27/6 Postage Extra: N.S.W. 2/9, INT. 4/6

New Carbon Resistors, well-known make. Colour code supplied
Low values to 5T ohms.
7/6 per 100. Postage 1/6.

I.F. TRANFORMERS

Standard I.F. transformers, square can (1 3/8) 455 Kc permatuned. **4/6**
(Plus Postage)

SAPPHIRE NEEDLES

Rothermel sapphire needles play 2000 recordings. Made in England.
Each 2/9 or 25/- dozen.

Telephone Generators

New small telephone generators, ideal for bell ringing, etc.

12/6 Postage Extra

MERCURY SWITCHES

The switch with 1000 uses 2/6
Postage 6d.

New Coils and Intermediate Transformers to suit all valves.
B/C Coils, shielded 9/6
S/W Coils, 16 to 49 Metres 9/-
Aerial R.F. or Osc. Inters. 455 KC.

11/6

POTENTIOMETER SPECIAL

Box of 10 new Carbon Potentiometers.

Containing .5 and .1 switch pots., long spindle, .5 and .1 standard and miniature pots, long spindle and other mixed sizes, short spindle.

20/-

Post 2/6.

CONDENSER SPECIAL

Boxes of .100 new mica paper and electrolytic condensers in values ranging from 50pf. mica to 5 400v paper. Values include .0001, .00025, .00075, .01, .02, .05, .1. Also 500 mfd/12v, 10 mfd/40v, 8 mfd/525v. 16 mfd/350v, electrolytics

30/- per 100.

Post Extra: N.S.W. 2/6; INT., 3/6

POTENTIOMETERS

½ Meg. Miniature Switch Pots, d/p Switch Long Spindle	3/6
1 Miniature Long Spindle	3/6
Standard ½ or 1 meg. switch pots., long spindle d/p switch	5/6
½ meg or 2ST. ohms short spindle switch pots	2/6
½ meg or 100T standard pots, long spindle	3/6
1½ meg. or 100T short spindle	1/9
5 meg. high insulation	5/-

All plus postage.

NEW SMITH'S 8-DAY CLOCKS

These English Clocks — which are new in original cartons—are panel mounting and are ideal for cars, etc. Luminous dials.

2in £4/15/-
2¼in with sweep second hand £5/15/-

Please address all correspondence to 479 Parramatta Road, Leichhardt, N.S.W.

METROPOLITAN RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE LM7398
479 PARRAMATTA ROAD. LEICHHARDT, N.S.W. PHONE LM3610
640 KING STREET, ST. PETERS, N.S.W. PHONE LA6087

Leading Specialists in ex-Government Technical Equipment and innumerable useful gadgets.

WALTHAM TRADING CO.

Sydney, 96 Oxford St. Mail Orders, P.O. Box 22, Oxford St. Adelaide, 243 Rundle St. Mail Orders, same address

229 Elizabeth Street, Melbourne

MAIL ORDERS TO BOX 5234 ELIZABETH ST., POST OFFICE.

SPECIAL OFFER
RECORDING TAPE

3,000ft (approx.) £3/3/
1,200ft (approx.) £1/10/
Packing and postage (all States), 4/.

METAL RODS

Useful for TV masts, tent poles, curtain rods, etc. In 3ft 6in lengths; diameter 7/8in, **3/6 ea.**
Freight forward rail.
For many jobs around home.

PERISCOPE VIEWERS

Ideal for watching football matches.
Price: 8/6. Prisms, **25/-.**
Call and select.

PRISMATIC COMPASSES

Oil-filled. Army Type. Calibration inside, 360 deg. outside, 32 pts. dia. 2½in. For Hikers, Surveyors, etc.

Price: £12/10/ ea.

Packing and postage, 3/.

OTHER COMPASSES, **2/6** to **12/6.**

Oster Switching Motors

In 12 and 24 volts 6 r.p.m. and 20 r.p.m. Reduction, **50/** each type Packing and postage. 7/6: Interstate, 10/6.

RADIO VALVES

Don't pay high prices for replacements. See our large, low-priced lots. SPECIAL PRICES TO RADIO DEALERS FOR QUANTITIES, on application.

1D8	8/11	6A8G	12/6	VR53	12/6
1H6G	5/-	6U7G	6/9	VR100	10/6
1K7G	3/6	6F8G	12/6	VR105	15/-
1L5GT	8/11	6C8G	12/6	VR150	15/-
1S5	12/6	6D6	12/6	VR78	7/6
100TH	39/6	6E5	7/6	VR65A	2/6
12C8	10/6	6H6GT	3/11	7A6	5/-
12SR7	2/11	6J5	12/6	7A8	5/-
12SK7	10/6	6K7	6/11	7C5	5/-
1J6	7/6	6K8G	10/6	7C7	5/-
12J5GT	10/6	AV11	5/-	7W7	5/-
12A6	7/11	CV6	7/6	7193	2/11
12K8T	12/6	CV66	15/-	801	25/-
12SJ7	12/6	6L7	12/6	803	40/-
12SC7	12/6	6AC7	3/11	807	19/6
12SL7GT	10/6	6Y6G	12/6	811A	70/-
12SF7	12/6	6AJ5	12/6	829A	59/6
1626	5/-	6N7	9/11	830B	40/-
1629	7/6	6SA7GT/G	8/11	837	25/-
1632	12/6	6SF5	7/6	885	25/-
2C26A	17/6	6SH7	7/6	955	10/6
25Z6	15/-	6SS7	7/11	954	5/6
2051	15/-	6SJ7GT	12/6	958A	10/6
25L6GT	15/-	6J7GT	7/11	3S4	12/6
3Q5GT	12/6	EF50	3/6		
6A3	17/6				
6A6	10/6				

Please add postage.

Here Are Many Fine Things In Radio, And At Bargain Prices

Here Are Many Fine Things In Radio, And At Bargain Prices.
A.W.A. RECEIVER, TYPE 2—1C6770. 5 Bands: 200 Kcs—30 Mcs 230V AC input. **£50.**
A.W.A. RECEIVER, 332C6940, 3 Bands: 1.4 to 3 Mcs, 2.5 to 9 Mcs, 7.5 to 23.5 Mcs AC 230-240 volt input; 8 Circuits: 1 Beat Oscillator; 7 Valves; Low Impedance Output. **£45**
AWA TELERADIO-TRANSMITTER 3BZ. 12V DC Working operation instructions in set., 2.5 to 5 Mcs. Double **£35.**
WALKIE-TALKIE SETS. SET No. 88. 14 Valves Crystal-tuned, 4 positions: 38.01, 38.6, 39.3, 39.7 Mcs Battery Input 1.5V for heating, 90-135V for HT. Hand-pressed Send-Receive Switch; Headphones and Microphone connected with one 3-pin plug. Price, **£22/10/.**
SET No. 108 Mk III Transceiver, 2.5 to 3.5 Mcs, operating instructions in set. Mike—No. 3 Headphones, Low Impedance. **£15.**
SET No. 128. Transceiver for Battery or Vibrator Pack. Diagram in set. Range, 2.5 to 4.5 Mcs. Working for Master Oscillator on 3 crystals. **£15.**
SET No. 46. Crystal-tuned, 3 positions. Rec. crystal must be 1550 Kc higher or lower (I.F 1550 Kc) as the Transmitter crystal. Coil range 3.6 to 4.3 Mcs (coil is in set). Set range, 2.5 to 7.5 Mcs. **£25.**

DURAL TUBING

We can supply this (Melbourne branch only) in a variety of sizes. This strong metal alloy hollow tubing can be used for many purposes, such as tent poles, rails, and as an aid for interior decoration. Details:

Diameter	Gauge	Price per ft
1 3/8in	3/16in	6/
1 3/8in	3/32in	3/
1 3/8in	1/32in	2
1½in	1/32in	2/
¾in	9/32in	2/
1 1/8in	1/32in	1/9
1in	3/16in	1/9
9/16in	1/8in	1/6
9/16in	1/32in	1/3
7/16in	1/16in	1/
¼in	1/32in	6d
5/32in	1/32in	5d

MOTORISTS!
DASHBOARD CLOCKS

SMITHS CLOCK, with 8 day Ancre movement: 12-hour dial, luminous hands and dial: 7 jewels. Also fitted with Elapse Time Hands for calculation of time occupied on a journey. **STANDARD MODEL**, in metal case: dial, 1 7/8in. dia., 1 7/8in deep. **£5.**

Packing and reg. post, 3/6; 1/state, 5/.

RECTIFIERS

Build your Battery Chargers with these.

6 volt 2 amp.	24/6
6 volt 3 amp.	34/6
6 volt 4 amp.	45/6
6 volt 5 amp.	50/
6 volt 10 amp.	79/6
12 volt 2 amp.	32/6
12 volt 3 amp.	45/
12 volt 5 amp.	79/6
48 volt 2 amp.	70/

Look at these Bargains

Headphones: High Impedance, **32/6**; Low Impedance, **17/6.** Packing and postage **3/.** Crystal Sets, **49/6.** Packing and delivery to rail, **5/.** Variable condensers for crystal sets, **7/6.** Call and select. Crystal set cabinets, **7/6.** Call and see Germanium Diodes for crystal sets **7/6** (post free). Book on Crystal Set Construction, **1/6** Postage, 4d. No 3 Hand Microphone, **17/6.** Packing and postage, 3/. Parabolic Mirrors, 3½in diameter, **15/.** Packing and postage, 4/. These also are worth inspection: Gear Reduction Boxes, worm and wheel 50-1 reduction, **35/.** Morse Buzzers, **10/6 each.**

Q22 TWIN WIRE,
100yds on Steel Drum

Ideal for telephones bells, low-voltage lighting, etc

Waterproofed for outdoor use

Price: **27/6** per reel

Packing and delivery to railhead, 5/.

TANK WHIP AERIALS

Flexible steel. Makes fine fishing rods.
2 sections (8ft) **15/**
3 sections (12ft) **22/6**
Rubber bases to fit **12/6**
Packing and postage, 5/.

Please write for our CATALOGUE
Mention State from which letter is sent and kindly include 6d for postage.

ANSWERS TO CORRESPONDENTS

J.B. (Brisbane, Q.) complains that he posted a letter to our query service in January last and that no reply has yet appeared in these columns. He repeats his query which concerns the connection of headphones to a push-pull amplifier.

A. We regret that you have been inconvenienced, J.B., and we have done our best to trace the letter to which you refer. Unfortunately we cannot remember handling it (our mail runs into hundreds of letters a week) and our mail book—wherein is recorded all incoming and outgoing mail—contains no reference to it. In the circumstances we can only assume that the letter was never received or that it has gone astray somewhere in our own system. It is rather unfortunate that you did not give us your full postal address on your last letter, J.B., so that we could have expedited matters with a postal reply. In the absence of this we can only reply as quickly as possible through these columns.

Concerning your query we would make the following points: Although it is permissible to connect headphones to the plate circuit of the output valve through a capacitor, this arrangement is not without its disadvantages. One is that the signal and hum level at this point are quite high, and it is often difficult to control the volume without reducing it to a value comparable with the hum level. These remarks are applicable equally to single-ended or push-pull systems, the latter using two coupling capacitors as you suggest. We are not quite sure what you mean by your reference to "loading the phones like D.C." or to a power transformer "loading a power rectifier valve," but there is no objection to the method of connection you suggest, apart from the general ones stated earlier. In spite of your experience, we have found that the voice coil connection has a number of advantages. One is the absence of awkward D.C. voltages from the phone circuit and the other is a more reasonable signal level which is usually adequate in the phones when the speaker is operating at about normal room volume. This applies to both high and low impedance phones even when operating on the reduced voltage available from a 2- or 3-ohm voice coil. With a 15-ohm circuit the position would be much more favourable. If the speaker is not required it can be replaced with a 15-ohm resistor. The fact that your phones will not work in this position suggests that they may be faulty, and it would be advisable to check with another pair if possible.

T.M. (Moree, N.S.W.) wishes to make the Battery Charger and would like the name of a firm which is able to supply a complete kit of parts.

A. We are not aware of any specific firm which is making the complete kit of parts available. However, we feel that several of our advertisers who normally handle kit sets should be in a position to supply the necessary parts for such a charger.

S.E. (Newborough, Vic.) asks about the possibility of converting an English television receiver to operate in this country.

A. It would be possible to convert the receiver to operate here but it is unlikely to be a practical proposition, unless you can tackle the job yourself. Fundamental alterations have to be made in almost every part of the receiver and we feel that the cost would be a good deal more than the figure you have quoted. Then there is the question of transport costs. You would probably do much better if the receiver were sold in England and the money put toward a new receiver here.

R.C. (Maitland, N.S.W.) is interested to know if we have ever described a frequency meter suitable for use in a "ham" installation.

A. Yes, R.C., such an instrument was described in the August, 1949, issue of "Radio and Hobbies" and a copy of the circuit and other diagrams can be had through our query service in the normal way.

B.J. (Ferryden Park, S.A.) is having trouble with a crystal set which receives the local stations quite well but is subject to interference from a station relaying the A.B.C.'s overseas service at night. He wants to know if there is any way of curing this.

A. This sounds suspiciously like another of those cases where a crystal set is responding to a powerful short-wave transmitter, in this case either one of the Radio Australia outlets and which take part of their program from the A.B.C., or one of the A.B.C.'s own VL transmitters. We doubt whether very much can be done about it, though the first thing to determine would be the exact nature of the transmission and the frequency involved. It might then be possible to reduce the signal strength by means of a trap circuit tuned to the offending station. This is normally a parallel tuned circuit placed in series with the aerial lead and which offers a very high impedance to the frequency to which it is set. To receive the signals at full strength (assuming that they are from a short-wave transmitter) it would be necessary to wind a coil capable of tuning to the particular frequency and would be an interesting experiment. One of our coil data pamphlets available through our postal service would provide some basic data on which experiments could be based.

A.K.S. (Concord, N.S.W.) is anxious to obtain some data on speaker enclosures which will improve the performance of his speaker which is now mounted in a "butter box."

A. Almost anything will probably sound better than a butter box, A.K.S., even a plain flat baffle, and almost any vented enclosure would effect a considerable improvement. A series of articles on vented enclosures appeared in the September, October, and November, 1956, issues of "Radio TV and Hobbies" and a few copies of these issues are still available. The price is 2/ per copy. Alternatively you may care to try the scheme suggested for our latest radiogram.

J.M. (Bondi, N.S.W.) writes to say that he has a 4-valve commercial portable receiver and that he wishes to operate this from the mains. J.M. has obtained the circuit of a power supply for the Carry Set and wonders whether it would suit his requirements.

A. Provided the valves used in the commercial portable are similar to those used in the Carry Set which were standard 7-pin miniature valves, the difference in current drains is not likely to be significant and the Carry Set power supply should serve the purpose.

However, we recommend the power supply for portables which was featured in the October, 1956, issue. This supply has a more efficient filter system and would be essential with larger variety of portable, where the speaker would have a better bass response on account of the increase in cone area and baffling.

C.T. (Northcote, Vic.) sends a query about the assembly of the recently described baffle unit and also makes some suggestions for the description of a short-wave converter.

A. We are not quite sure that we have understood your query correctly, C.T., but we assume that you are referring to the order in which the baffle plates are fitted. If so, your interpretation of the article is correct. Many thanks for your suggestion regarding a short-wave converter and we will keep this idea in mind. In the meantime the circuit of the Two Band Converter of July, 1955, may serve as a basis for experiment.

G.K.H. (Goolamba, Vic.) is keen to build a communications receiver designed around modern miniature valves and wants to know if we plan to describe anything along these lines in the near future. He is also worried about the performance of certain ceramic capacitors when used in tuned circuits.

A. We have no immediate plans for a receiver along the lines you mention, G.K.H., although we will no doubt describe something like this eventually. The capacitors you are using are not really intended for use in tuned circuits, being designed mainly to provide as much capacitance as possible with a minimum inductance. Their power factor may well be very poor compared to other types, though they are still perfectly satisfactory in their intended application. In fact they are often the only answer to the difficult by-pass problems encountered at high frequencies. We have in mind to describe alternative forms of sweep generator as soon as time permits, though the present design works so well that we will probably rest on our laurels for a few months.

A.E.P. (Centennial Park, S.A.) is anxious to build a battery charger and has partly dismantled an old transformer which he wishes to rewind for the job. He wants to know if we can give him details of the transformer windings.

A. Sorry, A.E.P., but the design of special transformers is outside the scope of our service, particularly as we have no details of the transformer you are using. It is a pity that you have already dismantled the transformer, since it is possible to establish the turns-per-volt figure when a winding is removed. The usual procedure is to remove one or all of the low voltage windings, being careful to count the turns on each. From this the turns-per-volt figure can be determined and a new winding substituted based on this figure. A common one is five turns per volt. For a battery charger using a copper-oxide rectifier the transformer will need to deliver about five volts more than the nominal battery voltage in each case. Thus a six-volt battery will need an 11-volt winding, a 12-volt battery a 17-volt winding, and so on. The data for a 230-volt transformer can be scaled up for 240 volts on a simple proportionate basis, though the difference in practice would be very slight and hardly worth considering.

B.W. (Hamilton, Vic.) has built the transistor/crystal set described recently with excellent results but he would now like to experiment with modifications.

A. We are very pleased to learn that you have had reception up to 300 miles. Although the set has a much higher gain than a normal crystal set, we would not expect such good results. You can increase the selectivity, or ability of the set to sort out stations, by tapping the aerial nearer the earth end of the coil. Alternatively, you could employ two tuned circuits inductively coupled, as in the "Twin-Tune" Crystal Set described in the April, 1951, issue. Both methods will result in reduced volume but since you seem to have plenty, this may not be too serious. A small variable capacitor (say, 50 pF max.), in parallel with the main tuning capacitor will give bandspread but we do not think that this would be an advantage since it would not improve the ability of the set to separate stations and the dial is easy enough to tune with the full-size capacitor. There would be no advantage in using a potentiometer in place of the .1 meg. resistor and, in fact, damage could be done to the transistor with certain settings of the potentiometer.

The Radio, Television and Hobbies Query Service

All queries concerning our designs, to which a POSTAL REPLY is required must be accompanied by a postal note or stamps to the value of TWO SHILLINGS.

For the same fee, we will give advice by mail on radio matters, provided the information can be drawn from general knowledge. UNDER NO CIRCUMSTANCES, however, can we undertake to answer problems involving special research, modification to commercial equipment or the preparation of special circuits.

Whatever the subject matter, we must work on the principle that a letter is too involved if the reply takes more than 10 minutes of our time.

Queries not accompanied by the necessary fee will be answered FREE in the columns of the magazine and presented in such a way as to be of interest to other readers.

To those requiring only circuit reprints, &c., we will supply for TWO SHILLINGS diagrams and parts lists from our files covering up to three constructional projects. Scale blueprints showing the position of all holes and cutouts in standard chassis can be supplied for 5/-. These are available for nearly all our designs but please note they do NOT show wiring details.

Address your letters to The Technical Editor, RADIO, TELEVISION and HOBBIES, Box 2728C, GPO, Sydney.

Note that we do not deal in radio components. Price quotations and details of merchandise must be obtained direct from our advertisers.

SWITCH TO AWA

PUBLIC ADDRESS SPEAKERS

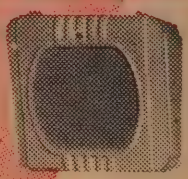
THE MOST COMPREHENSIVE RANGE OF SPEAKER ASSEMBLIES FOR EVERY REQUIREMENT.

PA138

Standard reflex horn speaker for medium distance projection of speech and incidental music.

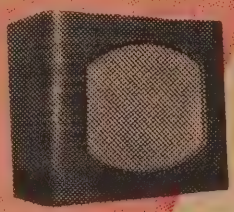
PA130

Standard exponential horn speaker for public address where distance projection of speech and incidental music is required.

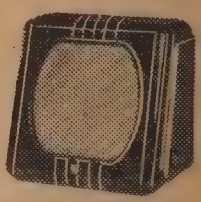


PA150/I

Attractive moulded ivory cabinet with 7" cone speaker and 600 ohm line transformer. Suitable for wall or desk mounting



Polished timber cabinet for wall or table mounting with 12" cone speaker and 600 ohm line transformer.

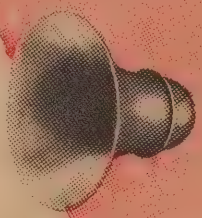


PA150/W

Moulded walnut speaker similar to above. These models are also available with 600 ohm stepped faders.

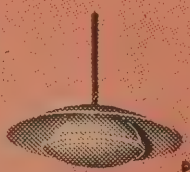
RESLO DRIVE UNITS: SU10 & SU12

Exclusive features are the self-locating diaphragm and the concentrically interlocked magnet which together produce an undisplaceable mechanical assembly, proof against de-centering.



PA108 & PA109

These flare baffles are for use with 7in and 12in permanent magnet cone speaker units and provide high conversion efficiency.

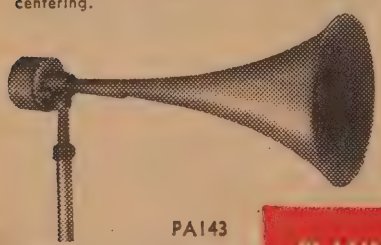


PA118

Pendant type, ceiling suspension, 360° diffusion speaker suitable for distribution of voice and music.

PA73

Ivory timber cabinet with 7in speaker for applications where a bi-directional characteristic is desired.



PA143

Short exponential horn speaker for distance projection of speech only.

PA177

Flush, ceiling mount 360° diffusion reproducer with 7" cone speaker. Can be colour matched to suit any background.

PA178

Surface mount reproducer similar to PA177, for use where flush fitting is not practicable.

PLANNED FOR OPTIMUM FAITHFULNESS OF SOUND REPRODUCTION, IN KEEPING WITH PHYSICAL AND COST REQUIREMENTS, IN STYLES AND FINISHES TO SUIT ANY BACKGROUND OR CIRCUMSTANCE OF USE.

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED

47 YORK STREET, SYDNEY. B0233. 167 QUEEN STREET, MELBOURNE. MU9161.

AVAILABLE IN OTHER STATES FROM

NEWTON McLAREN LTD., ADELAIDE. NOYES BROS. (MELBOURNE) LTD., HOBART AND LAUNCESTON. CHANDLERS PTY. LTD., BRISBANE. NICHOLSONS LTD., PERTH. ALSO FROM LEADING WHOLESALERS.

BUILDING OUR 17-inch TV RECEIVER

(Continued from Page 72)

line circuits, knowing that most modern micas will stand plenty of voltage without distress. Similarly, in three important positions in the circuit, we used 600-volt .047mfd tubulars, with a hint that a higher voltage rating would be a good thing.

As matters have turned out, it is now possible to obtain mica capacitors for all the critical positions, carrying a rating of 1,000 volts working and they have been suitably marked on the circuit.

The one special case is the 110pf capacitor connecting to the 6AX4-GT. A 1,000-volt capacitor could be used in this position with reasonable safety but it may be possible to obtain a mica or ceramic type with a rating of 1,500 volts or better.

HIGH VOLTAGE TYPES

For the three tubular capacitors mentioned earlier it is now possible to obtain 1,600-volt types. For details of the capacitors, see the Trade Review columns, elsewhere in the issue.

One other item, which warrants special comment, is the Contrast control potentiometer.

The control in the original receiver was a full-size carbon type, with an element rated fairly conservatively at 0.5 watt. We reckoned that this would permit a current of just over 30 milliamps through all or part of the element, without overload.

In practice, the original potentiometer is still in use.

However, we have heard of troubles with other smaller carbon potentiometers which are allegedly not large enough to justify an equivalent rating.

Accordingly, some constructors have used wire-wound potentiometers, some with success, others with apparent high frequency degeneration, due to cathode circuit inductance. At the time of writing, we have not been able to track down the full story of the wire-wound pots, but it would appear that they do vary widely in inductive qualities.

We have discovered, however, that the particular potentiometer we used has ceased production, due to some current shortage of element material, and the present difficulties are largely due to the fact that there are now none of the early stocks left.

LOWER VALUE POT.

It should be pointed out that a 200-ohm contrast control will be adequate in all but high signal areas, and a carbon type of this order will carry half again as much current for a given size and wattage as a 500-ohm potentiometer.

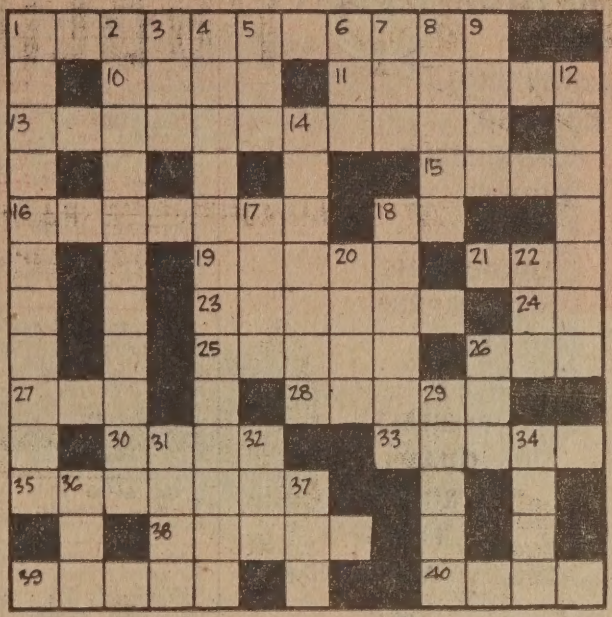
In the meantime, Messrs. Wm. J. McLellan have suggested that the best way out of the difficulty is to use a two-gang 1,000-ohm carbon type with the two sections wired in parallel. This will give an effective total element dissipation of 1 watt and a current-carrying capacity of well over 40 milliamps.

And now one final but important matter—that of possible interference from your TV set to nearby broadcast receivers.

The usual source of interference, which is not peculiar to home-built sets, by the way, is radiation from the line output circuits, notably the yoke and the leads thereto. It may be troublesome in areas where broadcast signals are weak and where the abovementioned components are more than normally exposed.

The cure is very simple and is identical with that adopted by most commercial manufacturers: Simply line the sides, top and rear of the cabinet with thin aluminium foil, attached with drawing pins or, if you like, glued to the wood. Copper gauze may also do the trick. Simply bond the shielding to the chassis and earth the whole lot, directly or via the power socket.

THE R., T.V. & H. CROSSWORD No. 38



ACROSS

1. Mutual action between components.
10. Made use of.
11. Gently flowing.
13. Changes frequency balance in sound reproduction (2 words).
15. Report of recent happenings.
16. Letting.
18. Chemical symbol for tellurium.
19. Covered by a thick mist.
21. Prefix meaning life.
23. State of being mentally deficient.
24. Chemical symbol of copper.
25. Composition from different authors.
26. Man's name.
27. Prefix meaning three.
28. Spectre.
30. After the proper time.
33. To push lightly.
35. Reprieve.
38. Flys high.
39. A colour.
40. Slender round bars.

DOWN

1. Component of a vibrator.
2. Inductors used in resonant circuit (2 words).
3. Point of a compass.
4. Conversion of AC into DC.
5. Fuss.
6. Tiny child.
7. Affix meaning more.
8. Form of oxygen to combat odours.
9. River in Egypt.
12. In the form of an aeriform fluid.
14. Wall of scantling filled with bricks.
17. Point where current or voltage is at a minimum.
18. American colloquialism for business magnate.
20. A barbarian.
22. Water turned solid.
26. Limited (abbrev.)
29. Prefix meaning over, above.
31. Semi-circular recess in a church, etc.
32. Greek letter.
34. Valve element.
36. Organ of hearing.
37. Historic period of time.

Solution and further crossword next month

Last month's solution

S	C	R	E	E	N	G	R	I	D		G	
E		H		L		I	O	D	I	N	E	
L		E	S	E		A	N	O	D	Y	N	E
F	O	O	T	C	A	N	D	L	E		E	
C		S	A	T		T	O		L		R	E
A		T	I	R	E	S		S	P	E	A	K
P	I	A	N	O			S		H	A	T	E
A		T		M	O	S	Q	U	I	T	O	
C		S	E	A	T		U		A	I	R	S
I			S	L	I	D	E			N		I
T	A	R	S	U	S		L	U	G	G	E	D
Y			E	X			C		U			E
	M	I	X			S	H	U	N	T		S

ALL THE LEADING NAMES in HIGH FIDELITY

AEGIS
ARMSTRONG
COLLARO
CONNOISSEUR
DUODE
ELAC
GOODMANS
GRAMPION
LEAK
M.B.H.
PEERLESS
QUAD
RONETTE
THORENS
WHARFEDALE

at

AMPLASOUND CO.

126 BUCKINGHAM ST., SYDNEY
Audition Room, 35 Lewis St. Balgowlah
PHONE XJ4193

AUGUST 1957 SPECIAL

Sale Price 6/6 posted

COYNE'S 150 SHOP PRINTS, and instruction and reference book for Radioman and Electricians. The data in this manual, including the actual shop prints and motor diagrams, has been field tested in thousands of industrial concerns. Don't miss this offer.

Associated Trade Journals Co. Pty. Ltd.

N.Z.L. House, 42 Bridge Street, Sydney. Phone BU4091.

WANTED TO BUY, SELL OR EXCHANGE

FOR SALE: Playmaster No. 2 amplifier and control unit No. 6 complete. Perfect condition. Best offer accepted. **Jacoby, Mitchell and Co., 477-481 Kent St., Sydney.**

FOR SALE: Back issues of R. and H., 3/ per copy incl. post. **T. Weir, O'Connor St., Haberfield, N.S.W. UA2569.**

FOR SALE: Sell outright or separate, or exchange for good communication receiver, MN26C converted 240V, 5in Loran Cro Indicator Unit, BC453 converted 6V vibrator. Supply —all good order—offers to 14th. **G. Billett, 2GF, Grafton.**

FOR SALE: Unused recording equipment; Royce 17in turntable with motor and transformer; Royce Senior overhead traverser with screws; two 12in tables with motors and pulleys. Best offer. Write **15 Wellesley Rd., Hawthorn, Vic.**

FOR SALE: 3 Leatherette portable cabinets, 9 sets Stromberg Carlson 2 and 3 Gang Condensers, 2 Efco Dials, 1 12 volt Fan, all above new. 7 only Battery radio chassis with speakers, all with valves and working less cabinets, Radiola, STC, etc. 1 model 222 Calstan AC/DC valve tester with very little use, also quantity of small radio parts, etc. Must sell. Best offer. Freight paid. All sold separate if required. **Allan W. Davis, Bellbrook, via Kempsey, 2C.**

FOR SALE: Hi-Fi system. M.B.H. pick-up; Byers turntable; 17W U.L. amplifier; 2 speakers with crossover network. **FM6490, Sydney.**

FOR SALE: Disc Recorder, Prototype, 78 r.p.m. only, in two carrying cases, includes 8W amplifier, L.S. mic. Also 12-OX speaker in 8 cu. ft. vented baffle. What offers? **Griffiths, 62 Napier Cres., Essendon, W.5, Vic. Phone FU1362 after 6.30.**

FOR SALE: Playmaster No. 5; Control Unit No. 6; Goldring VR Pick-up Rolo 120X Philips 3-speed turntable Radio-Tuning unit. £40. **UJ3376.**

FOR SALE: Radio and Electrical business, 5-year lease, showing good profits, £800 approx. Walk in, walk out. Very suitable for young man wanting a good start. Must sell, ill health. **Reply c/- "Radio and Hobbies" Advertising.**

FOR SALE: Build a Model "Mayflower" ship. Excellent blue prints 33/- set. **Bolton, 72 King St., Sydney.** Catalogue 5/-.

FOR SALE: 10 Watt Hi-Fi amplifier P.P.2A3 built-in C.U. No. 7, £20. Rola G12, 12R speakers, £4/10/ each. B.S.R. 3-speed motor in carrying case, £6. HGP.40 P.U., 2 heads, £8. H.T. power supply, 30/. University mod. osc. 150 Kc-30 Mc A.C. power supply, £10. All as new, must sell. Best offers accepted. **G. R. Hannam, Toolamea, Vic.**

FOR SALE: Leak TL10 amplifier and point 1 control unit, brand new. **Phone Sydney XL3222.**

FOR SALE: Back issues of R. and H., 2/6 copy incl. post **H. C. Haskew, 56 Hyandra St., Griffith.**

FOR SALE: Radio, Telefunken, Model "Opus 7"; 9 valves; 4 waves; SW, MW, LW, VHFW. 6 speakers. Pushbutton controls 13 buttons). **Hans Cramer, 87 Jones Rd., Dandenong, Vic.**

FOR SALE: Back Nos. R. and H. for sale, April, 1939, to Oct., 1956, 2/ posted. Nov., 1956, to current copies 4/ posted, quote on large lots, also will buy spare R. and H. you have. If out of stock I will get it for you **A. J. Cox, 13 Glover St., Belmont, N.S.W.**

FOR SALE: 1 KVX .5A Pow. Sup., £26 Nat. HRO Rec., as new, 7 coils, fitted to par adaptor comp. with pow. sup., £95. Valves, 6J6, 6AG-5, 955 and VR tubes, 10/. **170 Dunning Av., Rosebery.**

WANTED: Vols. 6, 7, 9, 11 and 12 Aust. Off. Radio Service Manual. **McGilvery and Co., Eidsvold, Qld.**

FOR SALE: Dual amplifier and pre amplifier Wharfdale super 12in/CS/AL speaker in vented enclosure polished large size, with Goodman's Acoustic filter. Connoisseur turn table and motor leak dynamic pick up, 2 diamond heads, Chapman S.6BS tuner. All in good condition as new. Offers. **J. A. Dunne, Morgo St., Urunga, N.S.W.**

SELL: Sand filled 9 cu. ft. spkr. cabinet, not polished, £20. Audiom 80 spkr., £30. Axiom 80 spkr., £20. M.B.H. pick-up 16in arm. L.P. and 78 heads. Triple shield trans., £25. English Partridge "C" core (type C.F.B.), Williamson output trans., £25. Nova output trans. Williamson type, ultra-linear tapped, £8. R. and H. custom-built car radio, 6-valve, 6-volt, £20. **L. Alexander, 16 Cambridge St., Enmore.**

SELL: All back issues R., TV and H., 2/ per copy incl. post. Big stocks. Write **T. Weir, 56 O'Connor St., Haberfield, N.S.W. WA2569.**

SELL: A.T.5-A-R8 and A.C.V. with junction box, £45. **Gordon, Box 5, East Larington, Albury, Vic.**

SELL: Bendix compass receiver 240 operation, exc. condition, £35. **Ring XM7691, Sydney.**

SELL: 2 No. 11a, complete with tubes, 2 meters, plugs and cables, both power supplies, £8 each. **J. D. Purdow, Woombye, Qld.**

SELL: Tape recorder, American Masco 240 volt, complete with 3100ft tape and mirco-phone, excellent condition, £60. **Mr. O'Donnell, UY3400.**

SELL: Complete A.R.C. radio course, £8 or offer. Complete B.I.E.T. engineers course (P.M.G.) all textbooks, £15 or offer. S.-W. receiver 3-30 Mc, 9-valve bandspread, £16 or offer. **G. R. Hannan, P.O., Toolamba, Vic.**

SELL: Best offer complete set R. and H. **16 Alexandra Av., Canterbury, Melb.**

SELL: Hornby train and accessories. Write **L. Wilson, c/- P.O., Bensville via Woy Woy.**

SELL: BC348Q receiver, spare set valves, modified for 240 AC, practically new. Palec valve tester, extra meter, Bendix freq. meter, 240 AC. Best offer. **C. Kitzelmann, Base Sqdn., R.A.A.F., Canberra.**

WANTED TO SELL: Corner enclosure, 9 cubic feet, sand filled, for 12in speaker. **J. Baldock, JU5485 (Melb.).**

BOOKS: See our advertisement elsewhere in this issue. **Electronics Publications (Aust.).**

KENNETH MORAN: You did not send your address with your order. **Electronic Organ Co., Electronics Publications (Aust.).**

SWAP: 7in TV chassis for Tape recorder, any make. Contact **E. Samek, 114 Williams Rd., Prahran.**

THAT home-made TV set not performing too well? **Ring Windsor 7415 (Melb.)** any day **after 7 p.m.**

HOME-MADE TV set, Channel (2) only, £35. Ring **Windsor 484 (Melb.).**

WANTED: Frequency meter, pars. to **Roy Cook, 127 New England Highway, Maitland, N.S.W.**

WANTED: Radio Service manual, volume 9, offer higher price. **N. Wong, 127 Wharf St., Brisbane.**

WANTED: Heterodyne frequency meter. Coverage, condition and price to **S. Parow, Box 290, Dalby, Qld.**

WANTED: Second-hand small Dandy "Tom Tom" drum, and support. **T. Sullivan, Box 35, Caulfield, Vic.**

WANTED: V1G6GT valve. Apply **C. Braxton, 88 Orlando St., South Taranaki, N.Z.**

SPEAKERS: Cloth suspended, lowered one octave—prompt service. **XM6636.**

Q.S.T. Nov. '51. Price to Box 111, Junee, N.S.W

ROYCE DISC RECORDING EQUIPMENT—

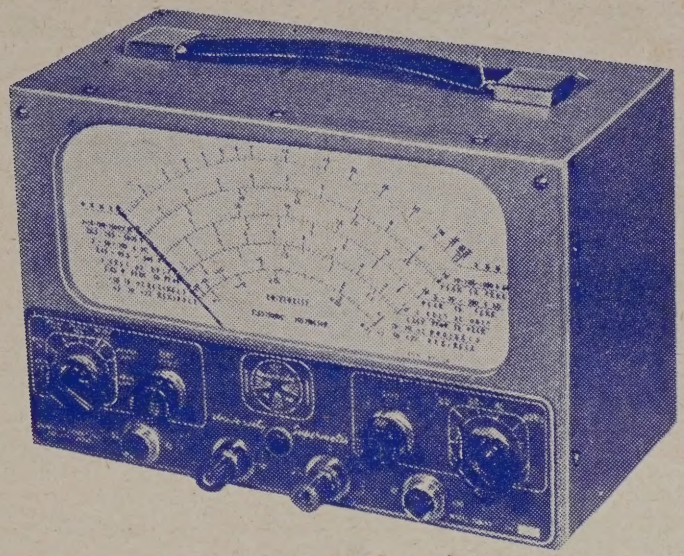
HI-FI CUTTING HEADS, HOT STYLI, AMPLIFIERS

Labels, Stroboscopes, Turntables, Blanks and All Accessories for the Recordist. Write for Catalogue of Prices.

BOX 5041Y, G.P.O., MELBOURNE

VIC., ROYCE RECORDING SUPPLIES, 291 EXHIBITION ST., MELB. FB2592
S.A., SCOTT SALES, 99 CURRIE ST., ADELAIDE. LA1201, ML1419.

FOR T.V. RADIO F.M. ELECTRONICS



This smartly styled University Model TVR/EV Electronic Voltmeter offers many new outstanding features, and is a basic measuring instrument for every branch of electronics. It offers accurate measurement of D.C. voltages, A.C. voltages, very wide resistance ranges, complete dB scales and extended ranges into RF volts.

A NEW V.T.V.M. FOR SERVICE and LAB.

Model TRV/EV.

This V.T.V.M. or as is more commonly known now, Electronic Voltmeter is designed for immediate use in Radio, F.M. and Electronic work and at the same time, is a Television instrument, thus allowing you to buy economically and plan ahead for the tremendous new future opening in this branch of electronics.

This attractive instrument is housed in a grey brocaded steel case with traditional University maroon and silver panel and all control knobs carry clear understandable markings making the instrument simple and effective in use.

A full size sensitive switchboard meter movement is built into the instrument, thus providing an unusually large scale making easier reading and more accurate measurements. The large 8-inch meter face is effectively and beautifully illuminated from the rear and the two colour scale has clear graduations and easy-to-read figures.

Model TVR/EV operates from a 240 volts AC mains and is supplied with instruction booklet, circuit diagram, D.C. voltage probe with inbuilt isolating resistor, A.C. voltage probe, ohms probe and earth lead. Available accessories are a 30,000 volt D.C. probe, a radio frequency crystal probe up to 50 volts at 250 m.c. and a valve probe enabling radio frequency voltages to be read up to 300 volts at 250 m.c.

Truly this is a remarkable instrument, packed into the small size of 10" x 6½" x 5½". You are invited to write for further details.

RANGES :

D.C. Volts Negative, 1-3-10-30-100-300-1000 and with external high voltage probe, 3000-9000 -30,000.

D.C. Volts Positive: 1-3-10-30-100-300-1000 and with external high voltage probe, 3000-9000-30,000.

A.C. Volts: 1-3-10-30-100-300-1000.

Peak to Peak A.C. Volts: 2.8-8.4-28-84-280-840-2800.

Ohms: 0-1000, 0-10000, 0-100,000, 0-1 Meg, 0-10 Meg, 0-100 Meg. 0-1000 Meg.

RF Volts: 1-3-10-30 (with crystal probe)

RF Volts: 1-3-10-30-100-300 (with valve probe)

DB Ranges: - 20 to + 2, + 2 to + 22, + 22 to + 42, + 42 to + 62 (Odb - 1 m.w. in 600 ohms)

Also Centre Zero D.C. Ranges for discriminator alignment.

Accessories available as extras:
30 KV DC probe
Crystal RF probe
Valve diode RF probe

UNIVERSITY GRAHAM INSTRUMENTS PTY. LTD.,
5 North York Street, SYDNEY ——BU3169.

UNIVERSITY GRAHAM INSTRUMENTS PTY. LTD.

Please mail me details of Model TVR/EV.

Name.....

Address.....

.....

Here's your chance to EARN BIG MONEY IN TELEVISION!

if you act NOW

TELEVISION IS HERE AND GROWING DAILY!

Television is now an established fact in Australia. It's the most fascinating science ever to come to this country. For ambitious men and lads, this is the biggest opportunity ever. Now is the time to train for a career in what is Australia's fastest growing industry. Trained technicians are in great demand and the Australian Radio and Television College can give you that training . . . knowledge that will lead you to a good job with good pay, your own successful business, etc.

A.R.T.C. CAN TRAIN YOU AS IT HAS THOUSANDS OF OTHERS

We enter our 26th year of training ambitious men for bigger incomes and greater security.
Thousands of ambitious Australians have realised the benefits offered by A.R.T.C. training and are now making big money in radio. You can become one of these successful men only by training, for it is the trained man who can get and hold the big radio-television jobs. For a few pence per day you can study radio the A.R.T.C. way, use your spare time to fit yourself for a successful future in radio-television

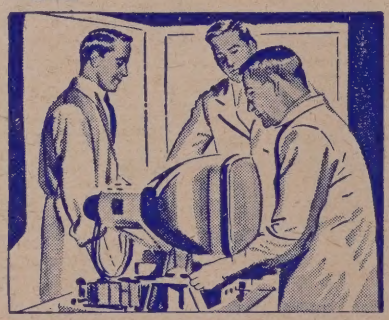
Ask yourself these 3 questions.

1. *Am I in a dead end job?*
2. *Can I use my spare time to get ahead?*
3. *Am I capable of earning more money?*

If the answer is yes, there is room for you in radio-television. Does your job really offer security —worthwhile prospects? If not, now is the time to do something about it. Send the coupon below for the free booklet "Careers in Radio and Television," which shows you just how A.R.T.C. training can help you to a bright future with good prospects

Remember there is big money ahead for the man who equips himself today for a future in radio-television. Scores of opportunities are open to the trained man and only to the trained man.

With A.R.T.C. you can obtain the training you need. At the benches and lecture halls of Australian Radio and Television College . . . or in your own home by correspondence . . . you can be taught every important aspect of radio-television, details of every new application of the fundamental principles. The A.R.T.C. comprehensive "Service Engineering" course teaches you from the ground up . . . step by step . . . at the speed you set for yourself.



Up-to-date Practical Lessons

The A.R.T.C. course gives you basic and advanced instruction in all phases of radio. Each lesson is made easy to understand by numerous illustrations and diagrams. No previous experience or high educational standard is necessary . . . A.R.T.C. will give you all the instruction you require. It is up to you . . . the A.R.T.C. course adapts itself to your requirements . . . its training has been proved by thousands of successful graduates.

Make Spare-Time Money

If you wish you can make your spare time earn money for you by training at home and many students make extra money after only the first few weeks. However, if it is not convenient for you to train at home, then you may use the modern A.R.T.C. workshops. The course is intensely practical and individual. Safeguard your future—mail the coupon today!

GET INTO ONE OF THESE PROFITABLE CAREERS IN RADIO/TELEVISION

There is a profitable career for you in the many phases of radio-television, including manufacturing, radio servicing, television servicing, research sales, broadcasting and televising executive, armed forces. A.R.T.C can help you gain one of these much sought after positions, but remember it is only the trained man who succeeds and A.R.T.C. can give you the complete training which is necessary.

MAIL COUPON NOW!

You are invited to mail the coupon below which can be your first step toward securing a job or business of your own with good prospects, security, and big money. A.R.T.C will mail you, by return, at no obligation to you, the big free booklet, "Careers in Radio and Television." This booklet will show you definite steps you can take for a better job—how you can succeed in life. Post the coupon, phone, or call NOW.

AUSTRALIAN RADIO & TELEVISION COLLEGE

PTY. LTD.

E. S. & A. BANK BUILDING,
Cnr. Broadway & City Road, Sydney.
(opp. Grace Bros.) Phone BA4891-2

AUSTRALIAN RADIO & TELEVISION COLLEGE PTY. LTD.
206 Broadway, Sydney, N.S.W.

Dear Sir,

Please send me without obligation your free booklet "Careers in Radio and Television".

NAME .....

ADDRESS .....

.....